OPERATIONS MANUAL

MANUAL INTRODUCTION 01.00.00

INTRODUCTION TO THE BATTLETECH UNIVERSE 01.01.00

Once again, war is a duel. The battlefields of the 31st century are dominated by BattleMechs, the most powerful war machines ever built. The typical Mech is humanoid in shape, stands 10 to 12 meters tall, and weighs 20 to 75 tons or more. It is the armored giant of myth and legend come to life.

Developed more than 500 years ago during the so-called Age Of War, a BattleMech is faster, more mobile, and better-armored than any 20th-century tank battalion. Furthermore, with its awesome arsenal of charged particle beams, lasers, rapid-fire autocannons, and missiles, a BattleMech can pack enough firepower to easily flatten anything in its way . . .

Anything, that is, but another Mech.

INTRODUCTION TO THE COCKPIT OPERATIONS MANUAL 01.02.00

This operation manual organizes the various systems available in the Defiance Industries *Mark 7* BattleMech Cockpit. The material for each set of control functions is presented in a separate section. There are sections describing the overall cockpit layout, the piloting systems, the combat systems, the information systems, and the cockpit configuration systems. In addition to a summary of each systems group, there are overview and inventory sections, desriptive sections for each control subsystem, and sections on system functions and operation.

This Operations Manual is organized to maximize its usefulness. Each Section stands alone, three-hole punched for easy reference and removal. Updates will provide replacement and additional pages as changes and system upgrades are documented.

01.03.00 MANUAL INTRODUCTION

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COCKPIT LAYOUT 02.00.00

MARK 7 COCKPIT OVERVIEW 02.00.00

Systems Summary 02.00.01

Definition 02.00.01.01

Defiance Industries' *Mark 7* BattleMech Command Cockpit is the self-contained pod in which the human MechWarrior is seated when he actually commands a BattleMech. The few systems that are peculiar to the cockpit itself are included here. Among these are the protective pod with its canopy, the bucket seat, and the auto-eject mechanism.

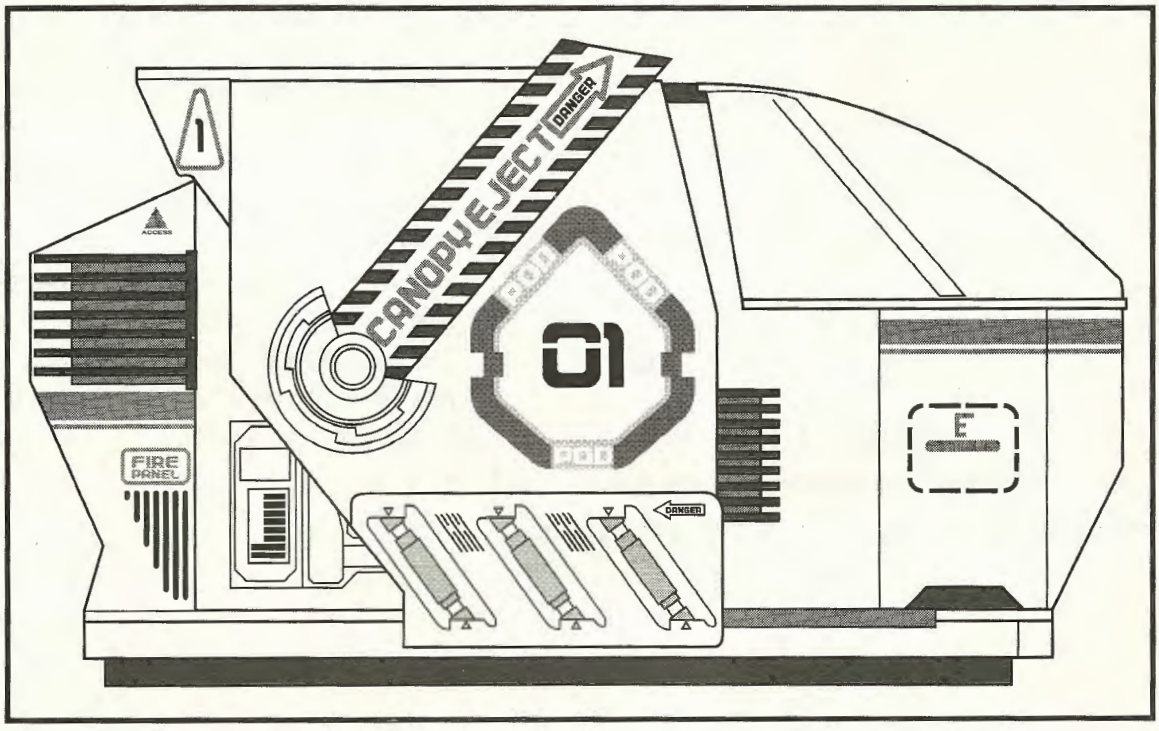
Inventory 02.00.01.02

The *Mark 7*'s Cockpit Systems include the *AeroFlo-X* pod shell and canopy, the *TPP-1* Bucket Seat, and the *X-CAPE* Auto-Eject Mechanism.

Categories 02.00.01.03

For the purposes of this manual, Cockpit Systems are divided into the following systems groups:

pod structural members, skin, and canopy;
pilot control seat; and
auto-eject mechanism.



THE DEFIANCE INDUSTRIES *MARK 7* BATTLEMECH COMMAND COCKPIT

02.02.00 COCKPIT LAYOUT

02.02.00 THE COCKPIT CONTROLS

Facing the pilot are two screens. The larger one is the *MainScreen*, which shows the view directly in front of the 'Mech's torso. This is the screen at #1 in the accompanying diagram.

Below the large screen is a smaller one, the *Secondary Screen*. It is where the on-board computer displays most of the data from its information systems, such as the radar image, the map, the spedometer, the heading compass, the damage display, and the IFF readout. This is the screen at #2 in the accompanying diagram. To the left of the Secondary Screen are the six *Secondary Screen Selectors* (#3) that control the Secondary Screen display.

The *Weapons Displays* (#4) flank the Main Screen. These tell what weapons are presently operational, the recharge/reload time, and the ammunition remaining for ballistic weapons, as well as which trigger fires each weapon.

On the raised panel to the far left of the Secondary Screen, below the left rank of Weapon Displays, is the *Heat Display* (#5), which provides information about the 'Mech's internal heat. To the right of the Secondary Screen are two banks of nine buttons each. The upper bank of buttons is the *MainScreen Scanner Control* (#6), which determines which sensors are used for visual display. It also incorporates the *Torso Rotation Controls*. Below this bank, are three rows of three buttons, the *Secondary Screen Soft Keys* (#7). Their function is determined by the Secondary Screen Selector currently in use. To the right of the Secondary Screen, on the raised panel below the right rank of Weapons Displays, is the *On-Board Computer Keypad* (#8). Its two readouts are just below it.

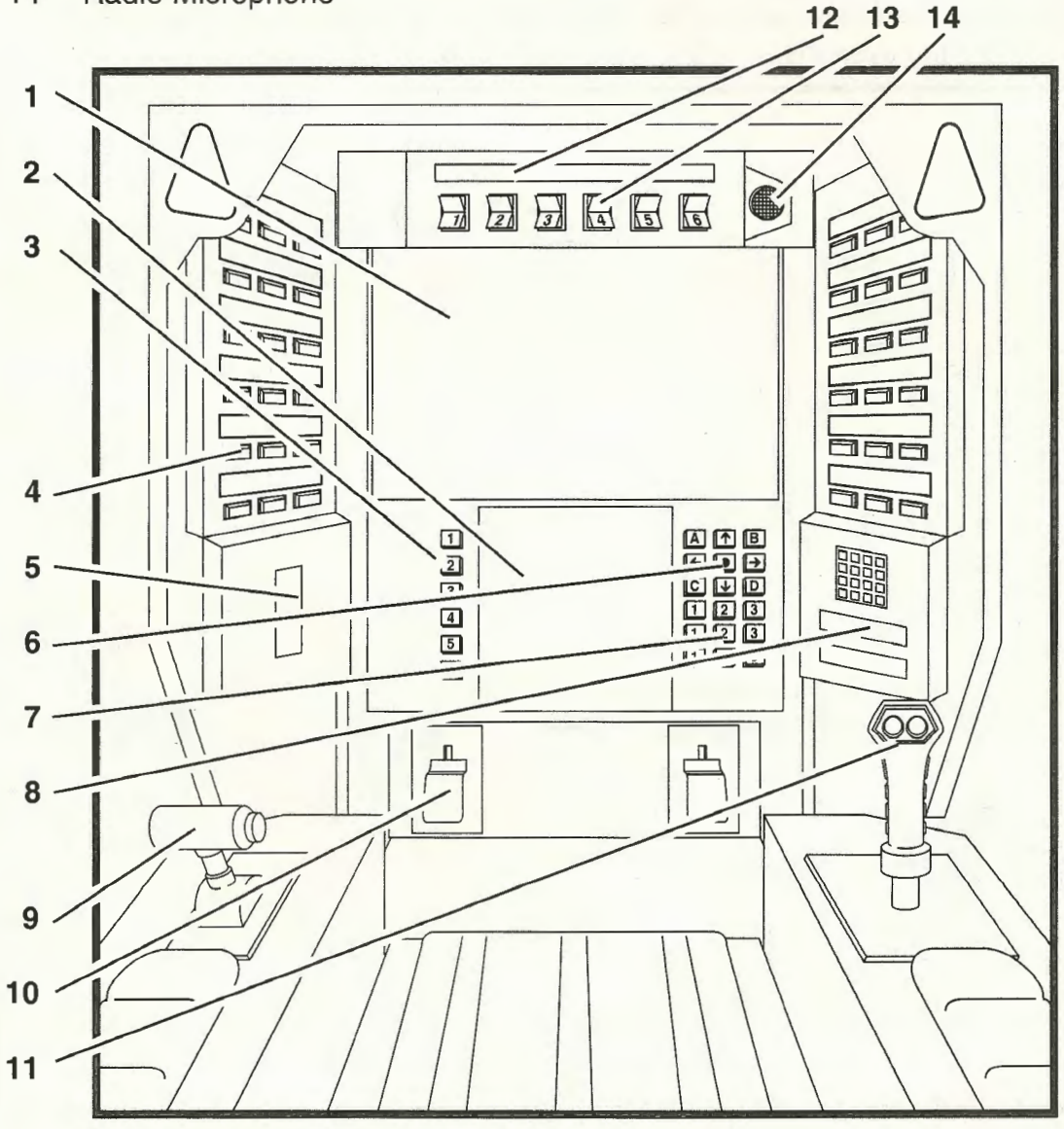
The *Throttle/Gear Shift* (#9) that controls the speed and direction of the 'Mech is on the left-hand armrest of the bucket seat. In the well below the console are the *Steering Control Foot Pedals* (#10). The *Weapons Joystick* (#11) controlling weapon fire is on the right-hand armrest of the bucket seat. It has three triggers.

Above the Primary Screen is the *Computer Message Center* (#12), the six *Overhead Console Rocker Switches* (#13) that control advanced functions, and the Radio Microphone (#14).

COCKPIT LAYOUT 02.02.01

BattleMech Cockpit Controls

1 Main Screen
2 Secondary Screen
3 Secondary Screen Selector Buttons
4 Weapon Displays
5 Heat Display
6 Main Screen Scanner Controls And Torso Rotation Controls
7 Secondary Screen Soft Keys
8 Main Computer Keypad And Readouts
9 Throttle And Gear Shift
10 Steering Control Foot Pedals
11 Weapons Joystick
12 Main Computer Message Center
13 Overhead Console Rocker Switches
14 Radio Microphone



03.00.00 PILOTING SYSTEMS

03.00.00 PILOTING SYSTEMS OVERVIEW

03.00.01 Systems Summary

03.00.01.01 Definition

Piloting systems are defined as those systems which affect the speed, acceleration, guidance, and overall attitude of the BattleMech. Included are throttling and transmission systems, steering systems, and torso rotation systems

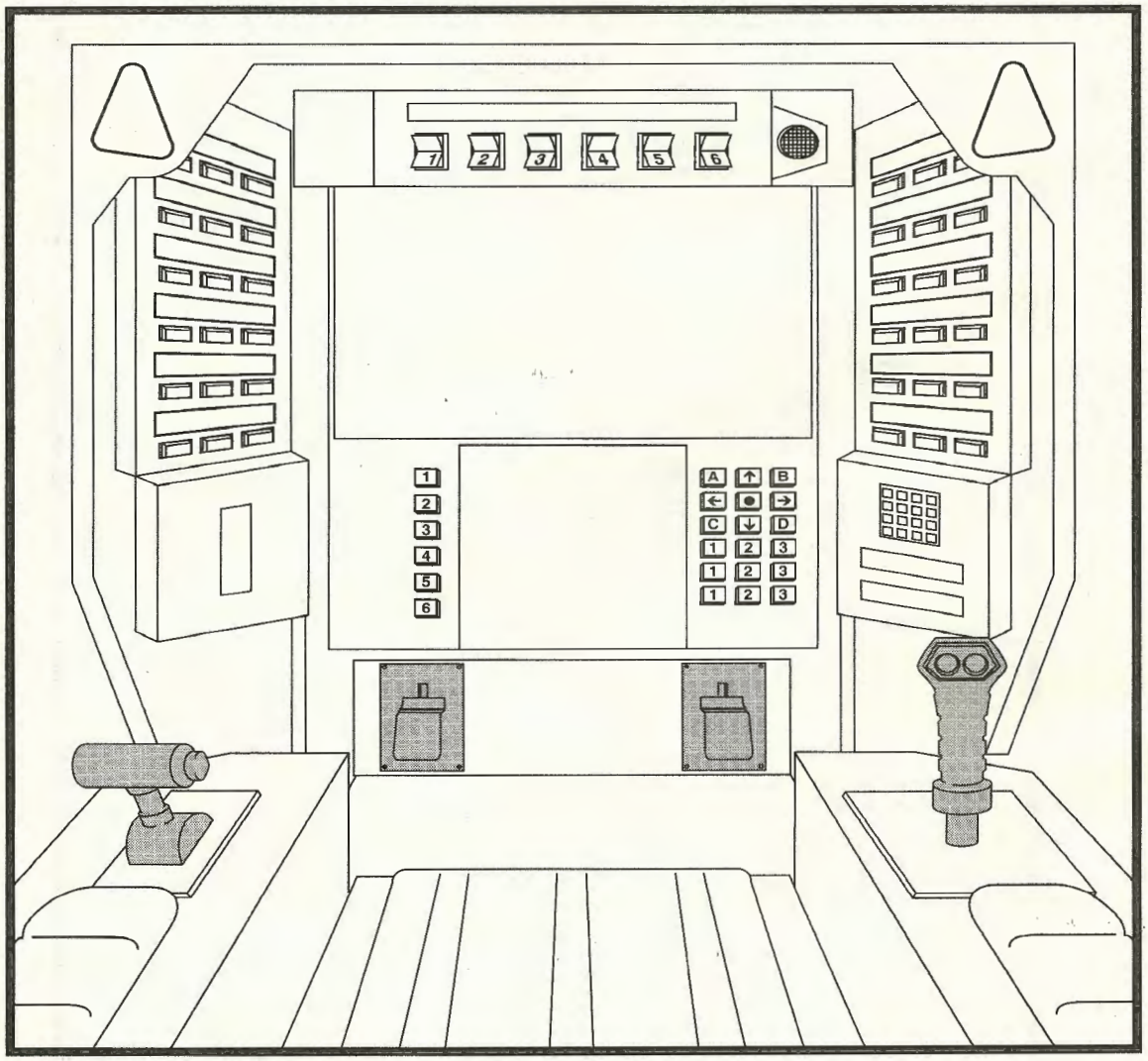
03.00.01.02 Inventory

Piloting systems installed in the *Mark 7* Cockpit include the *TH-3SB* Transmission Control System and the *AmbliCo AiM* Steering System. When used in tandem, these systems give the pilot a freedom of movement and ease of control not available in earlier cockpit models.

03.00.01.03 Categories

For the purposes of this manual, Piloting Systems are divided into the following systems categories, highlighted on the diagram below:

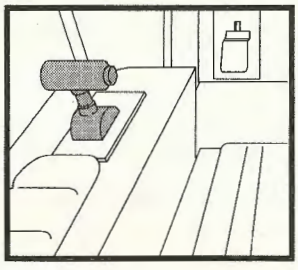
transmission, including throttle, brake, and gear-shift systems; and
steering systems, with standard foot-pedal or optional joystick control.



PILOTING SYSTEMS 03.01.00

TH-3SB TRANSMISSION CONTROL SYSTEM 03.01.00

System Summary 03.01.01



The *Mark 7* Cockpit has been modified to accept the *TH-3SB* Transmission Control System, mounted on the left armrest. Similar in appearance to earlier designs, this features an ergonomic movement arc wide enough to give pinpoint speed control. Combined with a redesigned breaking system controlled by the familiar thumb-actuated-toggle shift button, the *Mark 7* has throttling and breaking capabilities beyond any previous model.

Throttle Functions And Operation 03.01.02

Standard Forward Movement 03.01.02.01

The throttle on the left armrest controls the speed of the BattleMech. This speed may be monitored on the Secondary Screen speedometer.

TH-3SB THROTTLE

Operation 03.01.02.02

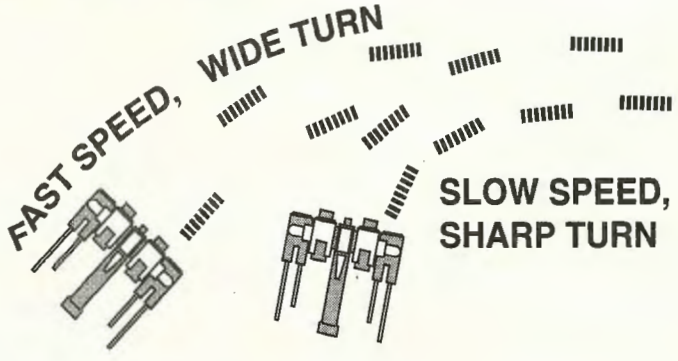
As the throttle is pushed toward the front of the cockpit, the BattleMech will move forward at increasing speed. When the throttle is pushed all the way forward, the 'Mech will accelerate at maximum speed. When the throttle is pulled all the way back, the Mech will decelerate to a complete stop.

Speedometer 03.01.02.03

The speedometer display appears vertically along the left edge of the Secondary Screen. It gives a linear readout of the Mech's current velocity and a precise digital readout in kilometers per hour.

Momentum Effects 03.01.02.04

Veteran pilots are aware that it takes time for a 'Mech to speed up and slow down. Though response to the *TH-3SB* throttle is instantaneous, at 75 tons or more the 'Mech is so heavy that its momentum prevents it from accelerating or decelerating as rapidly as the throttle might suggest.



03.01.03 PILOTING SYSTEMS

03.01.03 Reverse Movement Functions And Operation

03.01.03.01 Thumb-Actuated-Toggle Shift Button

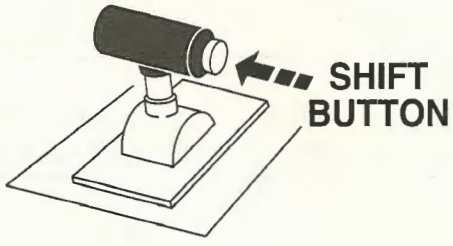
The red button on the throttle handle shifts the transmission between forward and reverse gears. It is a toggle activated by the thumb of the pilot's left hand. Each time it is pressed, it will shift the transmission to reverse the direction of travel, allowing the throttle to function normally independent of that direction of travel.

03.01.03.02 Operation

Refinements to the transmission allow the *TH-3SB* to shift into reverse gear while the Mech is in motion. To shift from forward to reverse, all the pilot need do is to toggle the thumb button on the throttle. If the Mech is stopped, it will move in reverse as soon as the throttle is pushed forward. If the Mech is moving forward, it will slow down, stop, and accelerate in reverse in response to the throttle.

Reverse motion is indicated on the speedometer in blue, as opposed to the normal yellow-gold of forward travel.

The Mech will move in reverse until the pilot re-engages forward gear. To go forward again, she must toggle the shift button with her thumb.



***TH-3SB* SHIFT BUTTON**

Because of transmission limitations, a Mech is limited to a maximum speed of 40 kph in reverse.

03.01.03.03 Braking

Pulling the throttle all the way back will stop a moving BattleMech slowly, as the transmission overcomes the Mech's momentum. Shifting without moving the throttle will also slow and stop the Mech, but at a much faster rate. Thus, the shift button can be used as a brake that allows more precise control over movement.

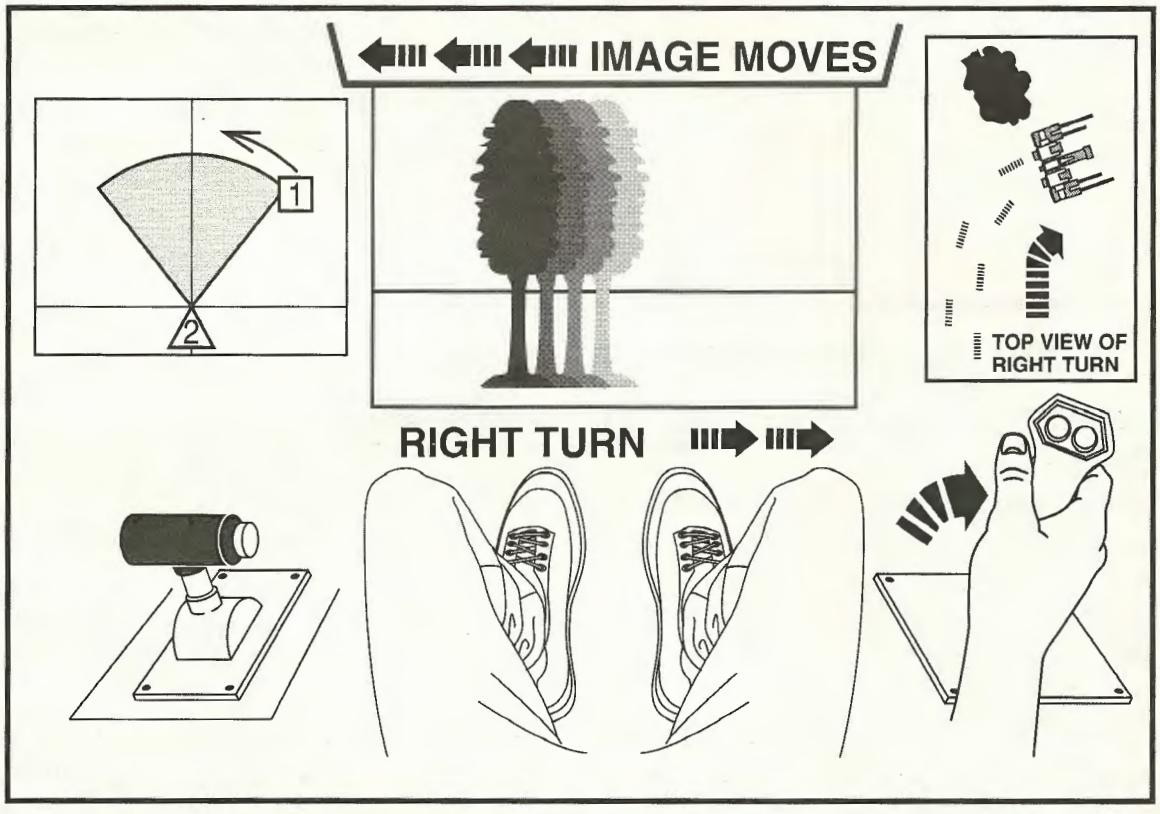
Despite modifications intended to strengthen the transmission, there is a chance that using the shift button to brake at high speeds may damage the transmission. Using the shift button to break at extreme speeds may even cause the Mech to topple, because the momentum of the torso is not lessened much by the braking effect of the transmission.

PILOTING SYSTEMS 03.02.00

AMBLICO AIM STEERING SYSTEM 03.02.00

System Summary 03.02.01

The *Mark 7* Cockpit incorporates the very successful *AmbliCo AiM* Steering System found in many cockpits from Defiance Industries. The system is controlled by the *WJS-4* Joystick in standard operation. Combined with a pilot-select over-ride, however, the Steering System may be controlled by the *FPS-77 U2* Foot Pedals for more advanced use.



STEERING WITH THE *WJS-4* JOYSTICK

Joystick Steering Over-ride 03.02.02

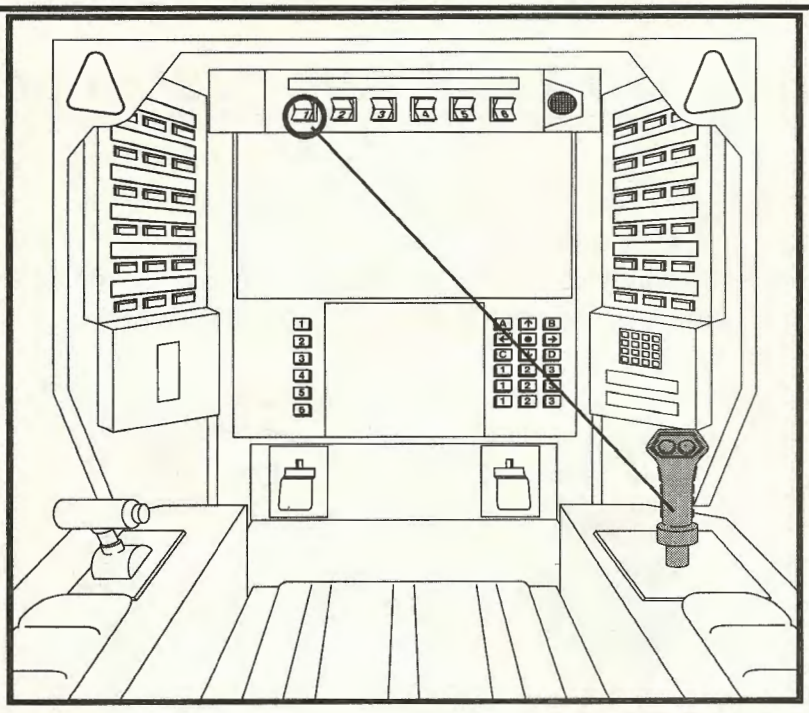
The *Amblico AiM* Steering System may be linked to the joystick for inexperienced pilots, in case of Foot-Pedal Control System malfunction, or just out of preference. All normal steering functions then are controlled with the *WJS-4* Joystick, over-riding the *FPS-77v2* pedals, which become inoperative. This, however, is at the expense of other optional joystick-linked functions, such as torso rotation.

Joystick Operation 03.02.02.01

Pushing the joystick to the right steers the Mech to the right. Pushing the joystick to the left steers the Mech to the left. The view on the Primary Screen and on the Secondary Screen Radar shift as they would normally (see Section 05.03.03). Additionally, the crosshair is locked in the vertical axis of the main screen with the joystick controlling the elevation and depression of the crosshairs.

03.02.03 PILOTING SYSTEMS

03.02.03.02



Foot Pedal Enable
Linking the Steering System to the foot pedals is accomplished by toggling Advanced Mode on. Rocker Switch #1 in the bank above the Primary Screen performs this function Full-Function Mode is operational and the foot pedals control steering when this rocker switch is toggled to blue.

***WJS-4* JOYSTICK STEERING LINKAGE**

03.02.03

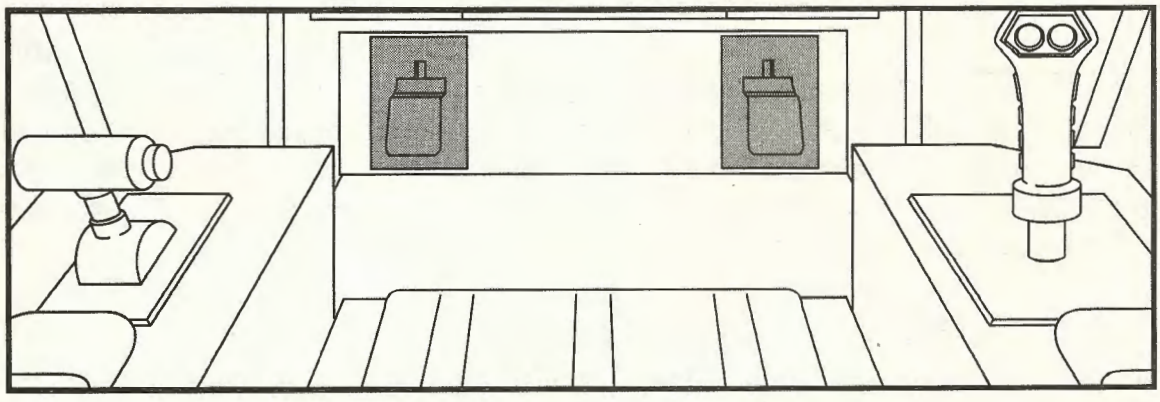
FPS-77v2 Foot-Pedal Steering Control System

03.02.03.03

Overview

It has long been recognized that MechWarrior pilots must be adept at controlling a wide variety of systems with limited resources. One of the earliest systems installed in Mech cockpits were steering pedals that removed the steering function from the joystick, allowing it to be used for more exacting weapons targeting. Though this separation of functions brought the feet into active play, the modification was hardly revolutionary or unusual.

The *FPS-77v2* is similar in appearance and function to earlier designs, but it is more ergonomic for less tiring continuous use. Its rugged and simple mechanical interface is virtually maintenance free.



***FPS-77v2* COCKPIT FOOT PEDALS**

PILOTING SYSTEMS 03.02.03

03.02.03.04

Inventory

Wells in the forward firewall at floor level contain pedals, one for each foot. The pedal plates are covered with neo-rubber to prevent slippage, under strenuous battle conditions.

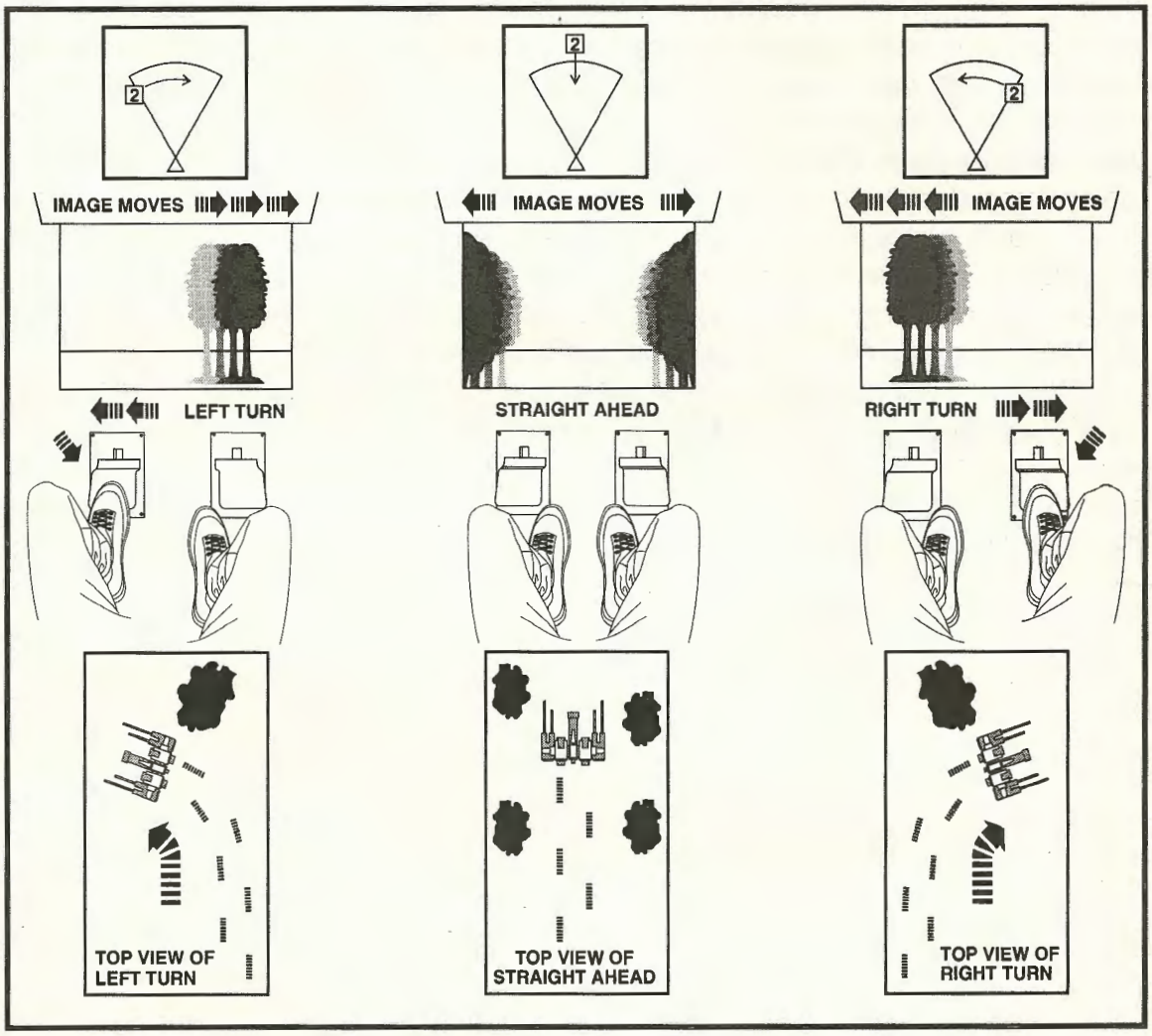
03.02.04

Foot-Pedal Steering System

03.02.04.01

Standard Forward Movement

The BattleMech will travel in a straight path if the feet are not activating the foot-pedals. When the Mech is running forward and the pilot has his feet off the pedals, objects will pass off the Primary Screen to the right, left, top, and bottom at equal rates. In addition, the symbols on the Secondary Screen Radar will move from the top of the screen towards the bottom.



FOOT PEDAL STEERING OPERATION

03.02.04 PILOTING SYSTEMS

03.02.04.02 **Pedal Operation**

A Mech is big enough and heavy enough to walk through some of the objects that pass off the bottom of the Primary Screen. When a Mech encounters objects that it cannot bulldoze, however, the pilot will have to steer around them to prevent collisions. To steer left or right, he must simply apply pressure with his foot in the direction he wishes to steer. To steer right, he presses down on the right pedal, and to steer left, he presses down on the left.

As the Mech steers to the right, the view on the Primary Screen will shift to the right. In addition, the symbols on the Secondary Screen Radar will rotate counterclockwise. When the 'Mech steers left, this will be reversed.

03.02.04.03 **Momentum Effects**

Veteran pilots know that, because of its great mass and momentum, a Mech will make tighter or wider turns depending upon its speed. The faster a Mech is moving, the wider a turn it will make. If it is moving slowly or is stopped completely, a Mech will make much sharper turns.

03.02.04.04 **Disengaging From Collisions**

Sometimes, despite expert maneuvering with the foot pedals, an impassable object will disappear off the bottom center of the Primary Screen. The noise of the collision is difficult to mistake, as the Mech loses its forward momentum instantaneously. Continued forward movement is impossible until the pilot disengages from the object by rotating in place with the foot pedals or by backing up.

To rotate in place, the pilot can press one of the foot pedals until the object is completely off the Primary Screen. The Mech should be disengaged, but if the banging noise persists, part of the Mech is still hung up, and the pilot must continue to rotate until the Mech is completely free. Bringing the Throttle to the Stop position may free the Mech more quickly.

COMBAT SYSTEMS 04.00.00

COMBAT SYSTEMS OVERVIEW 04.00.00

Systems Summary 04.00.01

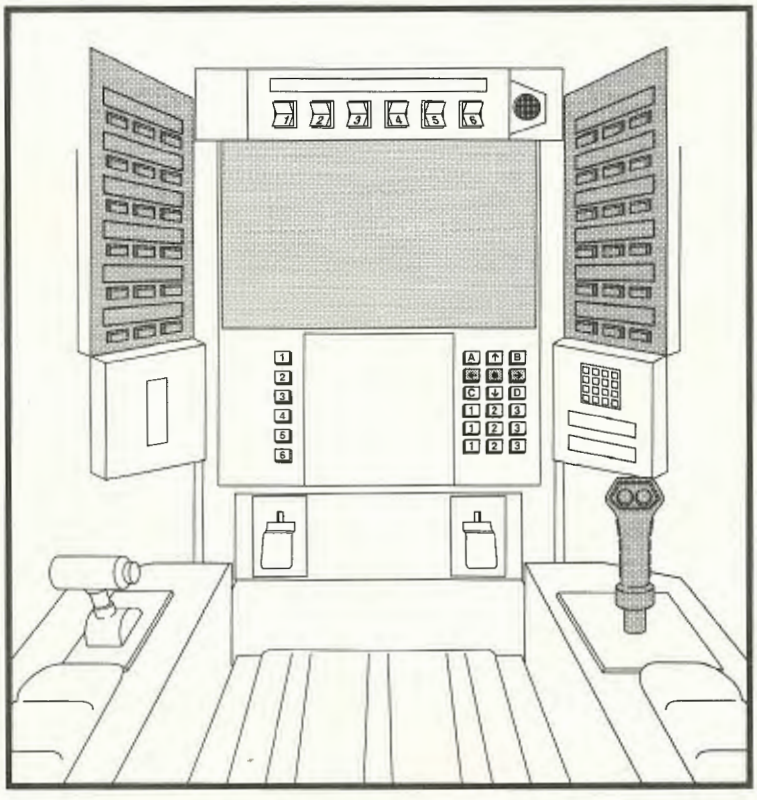
The weapons systems of Defiance Industries' *Mark 7* Cockpit fully integrate with any standard model BattleMech and many non-standard variants. With connectivity to all major weapons completely transparent, the *Mark 7* brings state-of-the-art fire control to a MechWarrior's fingertips. Green pilots will take comfort from the ease of operation provided by the *Mark 7*, and seasoned veterans will find themselves challenged to use its full potential.

Definition 04.00.01.01

Combat systems are defined as those systems of the BattleMech that control its offensive capabilities. Included are weapon targetting and other fire control systems. While not a weapons system by strict definition, the fire control systems are the brains that acquire and evaluate the data necessary for the various weapons systems to deploy their munitions accurately. In this sense, they fall among a BattleMech's overall weapons systems. The *Mark 7* Combat Systems integrate weapons operation with the Commannd/Control Communications Subsystems, Internal Environmental Control Subsystems, and Heat Management Subsystems.

Inventory 04.00.01.02

The Combat systems installed in the *Mark 7* Cockpit include the *ELIS* Rander Pinpoint Acquisition Radar, which is linked by the *OrGran-Z* Fire Control Computer to the *WJS-4* Weapon Targetting Joystick and the *TRB-3* Torso Rotation Control. When used in tandem, these systems give the pilot an ease of targetting and fire control not available in earlier cockpit models.



04.00.01 COMBAT SYSTEMS

04.00.01.03

Categories

Combat Systems for the purposes of this manual are divided into the following systems:

weapon displays, including trigger assignment buttons;
weapon targetting joystick, including firing triggers;
fire control computer;
target acquisition radar and intelligent cross-hair displays; and
torso rotation control systems.

Related systems described elsewhere this manual include the following Information Systems:

radar systems;
heat status display systems; and
damage display systems.

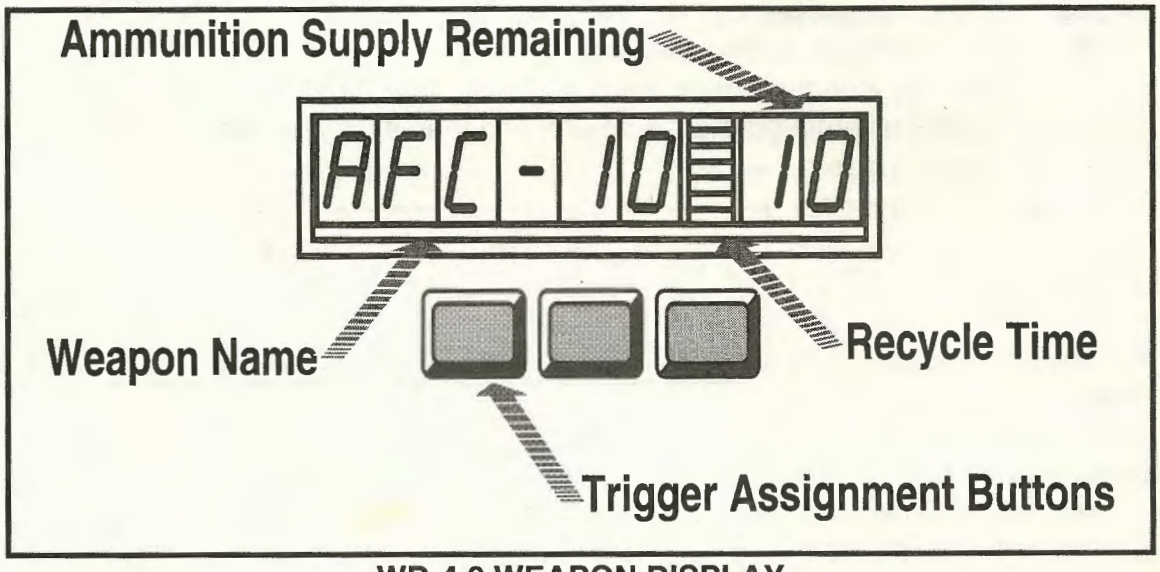
COMBAT SYSTEMS 04.01.00

WD-4.0 WEAPON DISPLAY SYSTEM 04.01.00

System Summary 04.01.01

A Mech may have from 1 to 12 different weapons mounted on it. There is a Weapon Display for each weapon mounted on the Mech. These may be found on the vertical panels to either side of the Main Screen. The Weapon Displays on the left side of the cockpit correspond to the weapons mounted on the Mech's left side, and those on the right are for the weapons mounted on the Mech's right side.

Each *WD-4.0* Weapon Display consists of a read-out and three illuminated buttons. The read-out tells the weapon's name, its recycle condition, and, for expendable munitions weapons, the ammunition left. The buttons indicate the current trigger assignment for the weapon, and are used to reassign triggers if desired.



WD-4.0 WEAPON DISPLAY

Weapon Display Functions And Operation 04.01.01

Weapon Name 04.01.01.01

The tables in Appendix 3: Weapons Data give the pertinent data for each weapon a BattleMech mounts. The standard abbreviation for each weapon is part of this information. The left part of the *WD-4.0* read-out gives the name of each weapon mounted as a standard abbreviation.

Recycle Display 04.01.01.02

Weapons that have just been fired cannot be fired again right away, because they must recycle either by reloading their ammo or recharging their energy banks. Some weapons recycle faster than others, as can be seen from the tables in Appendix 3: Weapons Data. Generally speaking, the more powerful the weapon the longer it takes to recycle.

In the center of the Weapon Display for each weapon is a vertical bar graph showing its recycle time. This is the Recycle Display. When the weapon is fired, its Recycle Display bar graphs will go dark. As the weapon recycles, the display will light up again. Once it becomes fully lit, the weapon can be fired again.

04.01.02 COMBAT SYSTEMS

04.01.01.03 **Ammunition Store**

Some weapons use expendable munitions, such as bullets or missiles. The number of shots remaining for each such weapon is indicated on the right side of its Weapon Display. Once a pilot expends this ammunition, the weapon is useless.

04.01.02 Trigger Assignment Buttons

Below each Weapon Display read-out are three buttons, one each of blue, red, and green. These buttons correspond with the three triggers on the *WJS-4* Joystick. When a weapon is active, one of these buttons will be illuminated to show the trigger assignment for that weapon.

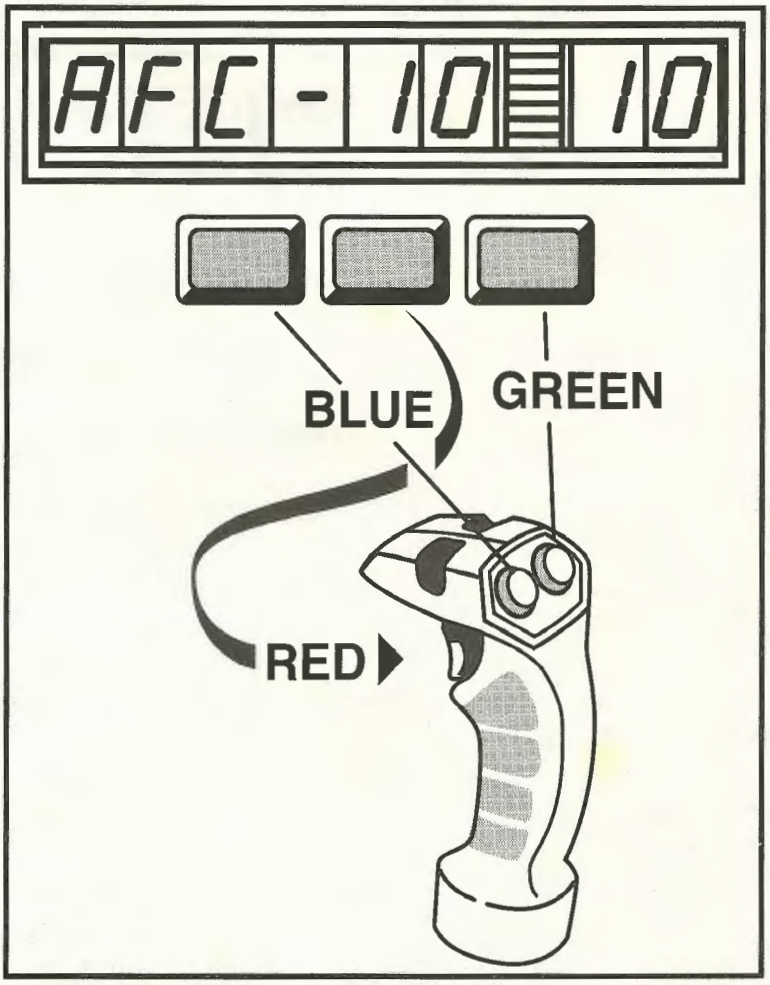
Using the Weapon Display, a pilot may reassign the trigger that fires any of a Mech's weapons. Re-configuring the trigger assignment will customize the settings to mesh with a pilot's personal fighting style. Many pilots have found that response time is decreased when using a personalized trigger configuration.

04.01.02.01 **Re-configuring Trigger Assignments**

Changing the trigger configuration is a two-step process. First the weapon must be removed from its current trigger assignment, and then it may be assigned to one or more of the other triggers.

To remove the trigger assignment for a weapon, the pilot must press the lighted button on the Weapon Display for that weapon. The button will go dark to indicate that the weapon is no longer active. To assign the weapon to a different trigger, the pilot must press the button colored the same as that trigger. When it lights up, the new trigger assignment is active.

For example, if a medium laser is assigned to the red trigger, and the pilot wants it moved to the blue, first she would press the red button on the medium laser's Weapon Display; the red light will go out. Next, she would press the blue button on the Weapon Display. The blue light will come on, and the weapon will fire on the blue trigger.



TRIGGER ASSIGNMENT BUTTONS

COMBAT SYSTEMS 04.02.00

ORGRAN-Z FIRE CONTROL SYSTEM 04.02.00

System Summary 04.02.01

The *Mark 7* Cockpit incorporates the latest in fire control technology. Coordinating several systems is the *OrGran-Z* Fire Control Computer, which links the *ELIS* Rander Pinpoint Acquisition Radar with the *WJS-4* Weapons Joystick aiming system. This sophisticated linkup provides weapons targeting accuracy and precision unprecedented in BattleMech control.

WJS-4 Weapons Joystick Aiming System 04.02.02

Overview 04.02.02.01

Centuries of mechanized warfare have refined the interface between the human operator/marksman and the actual weapon he controls. Abundant research has shown that fine-motor reflexes and control can be optimized when the aiming device is hand-operated and eye-targeted. Hand-eye coordination can be trained to operational maxima that even modern technology cannot master with computers alone. Thus, it is almost universally recognized that a radar-linked hand-held joystick targeting heads-up cross-hairs is the peak of modern weapons aiming.

Inventory 04.02.02.02

The primary interface between the MechWarrior pilot and the *OrGran-Z* Fire Control System is the *WJS-4* Weapons Joystick. This versatile weapons component incorporates weapon discharge triggers and aiming cross-hair movement control. In addition, it can be linked to over-ride the steering control foot pedals.

Targeting Or Movement Control 04.02.02.03

The *WJS-4* has a freedom of movement unsurpassed by any targeting or movement control joystick. It is fully operational in all cardinal directions, with total intermix capability. The flexible connection to the microchip controllers gives cross-hair movement control as fine as 0.005 mils while retaining the rugged construction required to stand up to battlefield stresses.

Weapon Discharge Triggers 04.02.02.04

There are three triggers on the *WJS-4*, each color coded to allow for weapon trigger assignments. The primary trigger, colored red, is operated by the forefinger. It is placed so that the forefinger closes naturally when the joystick is gripped. Two secondary triggers, colored green and blue, are thumb-operated. Their placement on the top of the joystick is comfortable and ergonomic.

04.02.03 COMBAT SYSTEMS

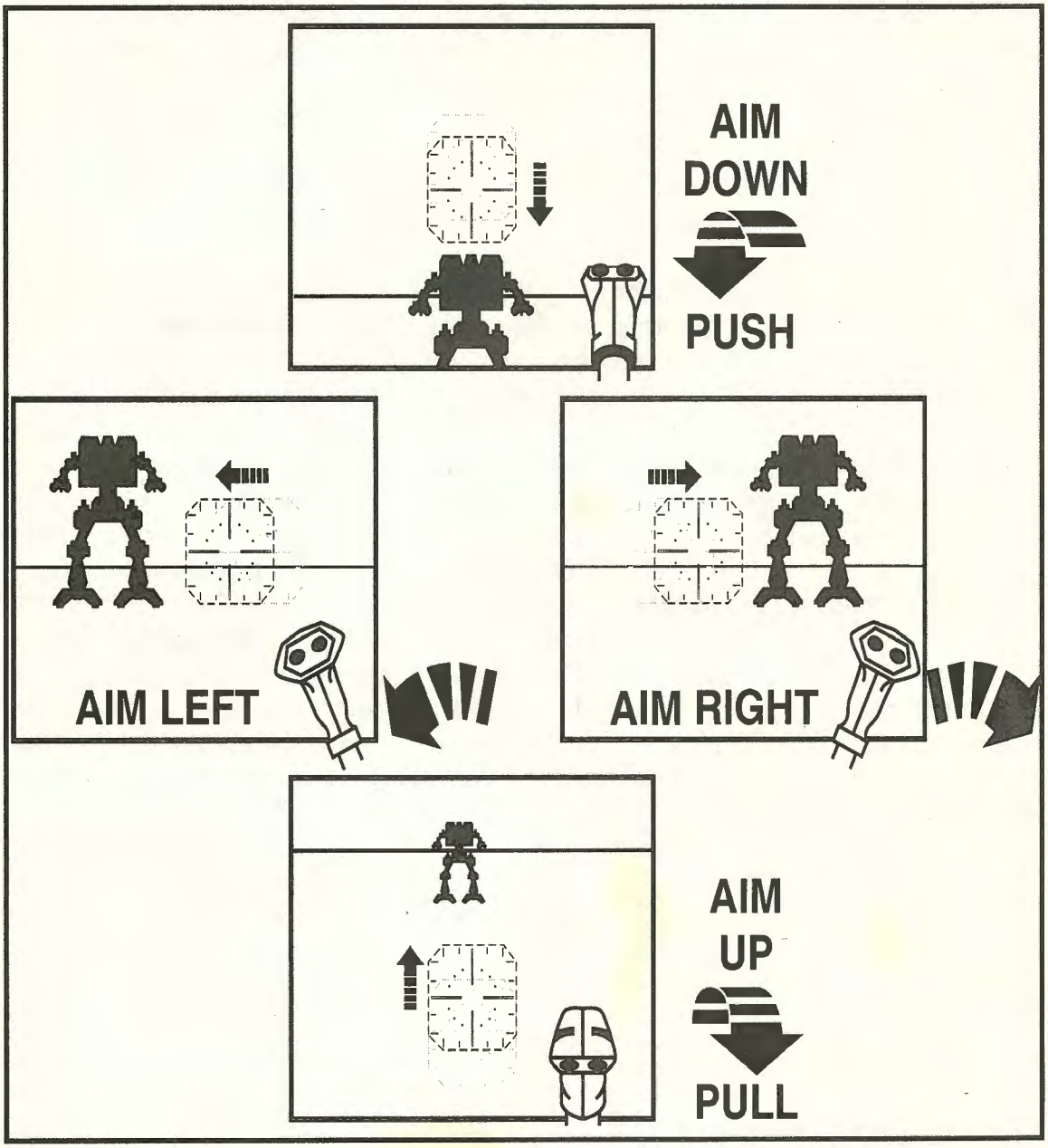
04.02.03

04.02.03.01

OrGran-Z Target Acquisition Cross-Hairs

Overview

Modern high-speed warfare would be impossible without sophisticated radar systems linked to intelligent display systems by powerful fire control computers. Ultra-fast computers are the heart of any fire control system, receiving and analyzing data from the target acquisition radar, displaying it to the marksman/pilot, and aiding her as she selects targets. For all its sophistication, a fire control system is virtually transparent to the user, as it must be to minimize the effects of the computer-pilot interface. In fact, many pilots never fully grasp the technology behind the interface they see, the target acquisition cross-hairs.



TARGET ACQUISITION: JOYSTICK-CROSSHAIR LINKAGE

COMBAT SYSTEMS 04.02.04

Inventory 04.02.03.02

In the *Mark 7*, the fire control computer displays its information to the pilot on the Main Screen via the *OrGran-Z* Target Acquisition Cross-Hairs. The computer links analyzed output from the *ELIS* Rander Pinpoint Acquisition Radar to the Main Screen allowing the pilot to aim all a BattleMech's weapons. The computer also links the stadia-dimensioned target acquisition display to the *WJS-4* Weapons Joystick.

Cross-Hair Movement 04.02.03.03

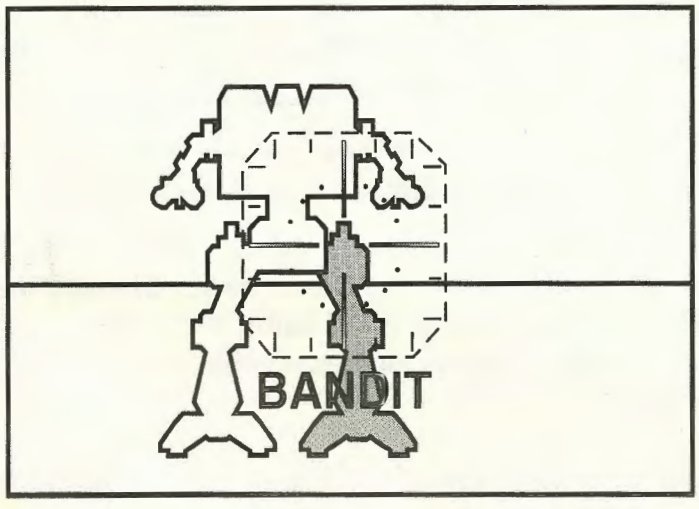
Cross-hair movement accompanies even the most minute movement of the joystick. Moving the WJS-4 weapons Joystick moves the cross-hairs back and forth across the screen, as well as up and down. Pushing forward on the joystick will move the cross-hairs toward the bottom of the screen. Pulling back on it will send them toward the top. Pushing left or right will send it in that direction.

A BattleMech can move its arm-mounted weapons somewhat independently of its torso aspect, and so the target acquisition cross-hairs are not locked to the center of the Main Screen as they would be on a jet fighter. Thus, the cross-hairs can target any object that is visible on the Main Screen. Operating in training mode will lock the horizontal axis of crosshair travel since the joystick's horizontal axis is used for directional control.

ELIS Rander Pinpoint Acquisition Radar 04.02.04

Overview 04.02.04.01

Perhaps the most useful feature of any fire control or information system is the intelligence of its radar. Today's radar systems provide a wealth of information at long and short range, from a computer-lock for targeted weapons to information about the direction and distance of targets.



***ORGRAN-Z* INTELLIGENT CROSS-HAIRS**

In a fire control system, some of the data generated by the radar is collected by the fire control computer. This data is not useful unless it has been analyzed and re-configured for instant recognition by the pilot. Analyzing the data from target acquisition radar is one of the main functions of the fire control computer. The data important to weapons targeting is displayed by the computer as "intelligent" cross-hairs and enhancements to images on the main information display. Such computer-enhanced displays allow pilots to assimilate massive amounts of related data quickly enough to make intelligent and efficient targeting choices. For example, below the cross-hairs is the call-sign of the pilot in the target Mech. Above the crosshairs is the range to the target Mech.

04.03.00 COMBAT SYSTEMS

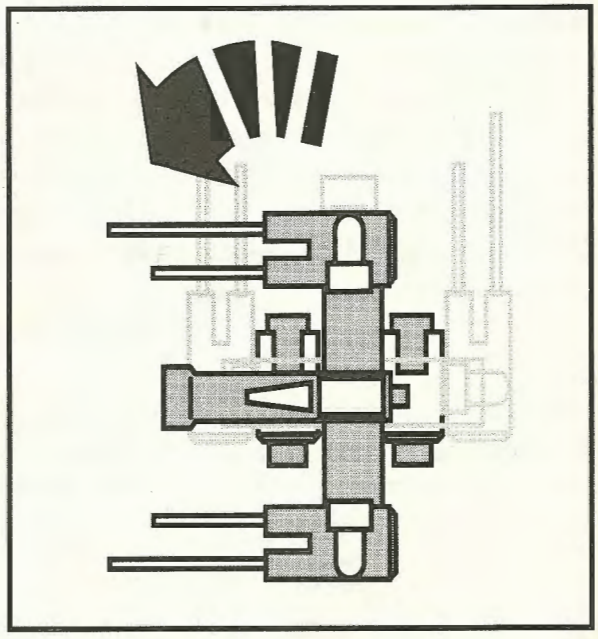
04.03.00 TORSO ROTATION SYSTEM

04.03.01 System Summary

A Mech can rotate its upper torso independent from the rest of its body. This will allow it to move in one direction while facing the torso in a completely different direction. Using this feature, it is possible to rotate a Mech's torso to face the opposite direction from the way it is moving, or even in a 360° arc. Pilots have found that torso rotation enables them to cover retreats, to fire more effectively at a target moving beside them, and to increase overall targeting flexibility.

04.03.01.01 Definition

Torso Rotation Systems are defined as those systems that enable torso rotation as well as those systems that control the direction and extent of rotation.



BATTLEMECH TORSO ROTATION

04.03.01.02 Inventory

Torso Rotation Systems include both the TRB-3 Pushbutton Torso Rotation Panel and the *WJS-4* Joystick.

Control over torso rotation must have a natural feel that does not distract from the main business of targeting weapons. The *Mark 7* cockpit design incorporates two differing methods of torso control, including both push-button and joystic control. This flexibility allows pilots the option of using the method that best fits their combat style.

Pushbutton control with an automatic return to the default position are the major aspects of the *Mark 7* Torso Rotation Control Panel. Joystick control, however, has the advantage of keeping the marksman/pilot's hands in the same place, and recent research has found that overall combat efficiency is increased when torso rotation is linked to the joystick.

04.03.01.03 Categories

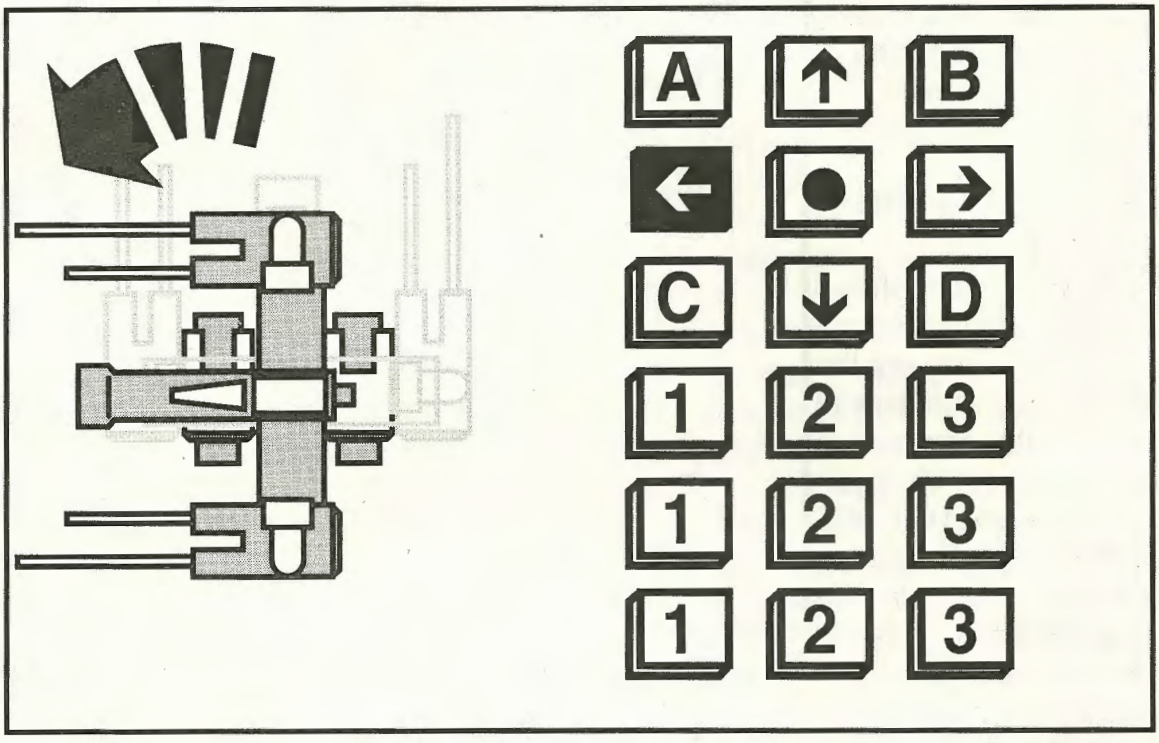
For the purposes of this manual, Torso Rotation Systems are divided into the following systems groups:

pushbutton control systems; and
joystick control systems.

COMBAT SYSTEMS 04.03.02

TRB-3 Pushbutton Torso Rotation Panel 04.03.02

The *TRB-3* PushbuttonTorso Rotation Panel is part of the Scanning Systems Control Panel to the right of the Secondary Screen. The center row of buttons in this panel are red overprinted with black symbols. They control the rotation of a Mech's torso.



USING THE TRB-3 PANEL FOR TORSO ROTATION TO THE LEFT

The button on the left is marked with a left arrow. Pressing the button on the left rotates the upper torso to the left. Continuing to depress the button will continue to rotate the torso toward the left. Similarly, the button on the right is marked with a right arrow. Pressing this button rotates the upper torso to the right. The button in the center is marked with a dot; shared with the Main Screen Aspect Control buttons, it returns the torso to the front-and-center default detent.

Joystick-Controlled Torso Rotation 04.03.03

The *WJS-4* Joystick can control the Torso Rotation System by enabling the linkage using the Overhead Rocker Switches. This is the mode most favored by advanced pilots, because it allows the most freedom in selecting, and in particular pursuing, targets. The right hand need never leave the Joystick to allow an enemy Mech to be fired upon even though it moves out of the Main Screen viewing area.

Without Joystick-Controlled Torso Rotation, the pilot's right hand must be removed from targetting and be used to rotate the torso with the TRB-3 Panel. With Joystick rotation control enabled, the cross-hairs are moved to the edge of the Main Screen as usual, and when they reach the edge of the viewing area, torso rotation begins without pause to keep the target in view.

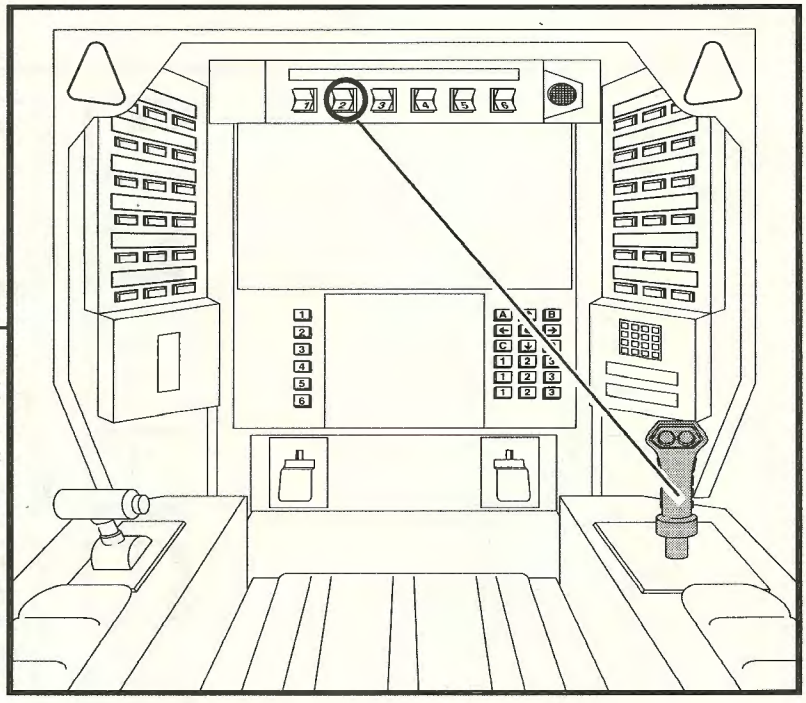
COMBAT SYSTEMS

04.03.03.01

Enabling Joystick-Control Of Torso Rotation

Toggling Overhead Rocker Switch #2 to green links the *WJS-4* Joystick to the Torso Rotation System. In this mode, the Joystick not only positions the cross-hairs on a target, but it also rotates the torso in the desired direction.This feature is not available in training mode.

In this mode the crosshairs are fixed to the centre of the main screen and all aiming is done by movement of the torso.



JOYSTICK TORSO CONTROL LINKAGE

04.03.04

Determining Torso Aspect

The Main Screen shows the view directly in front of the torso, and not the view in the direction of travel or the view toward the front of the Mech (always assumed to be the way the Mech's feet are facing). To relate the Main Screen view to the direction of travel or to the front of the Mech, a pilot must use the Secondary Screen.

04.03.04.01

Relating Torso Aspect To Front Of Mech

On the Radar Display,in the training mode the wedge indicates the angle of view. At the point of this wedge, the yellow arrow indicates the direction of travel. When the arrow points straight up, then the torso aspect is front and center. When the arrow points to the left, the torso is rotated to the right with respect to the Mech's feet. When the arrow points to the right, the torso is rotated to the left with respect to the Mech's feet.

COMBAT SYSTEMS 04.04.00

USING THE *MARK 7* COMBAT SYSTEMS 04.04.00

Effective use of the sophisticated weapons technology concentrated in the *Mark 7* cockpit is not possible without three important things: instruction, practice, and experience. No operations manual can hope to compete with a live instructor or even a simulator, but some obvious and some not-so-obvious remarks are in order concerning effective weapons use. The paragraphs below attempt to provide minimal instruction in the use of the Mark 7's various combat systems.

Selecting Weapons 04.04.01

Selecting which weapons to fire when is an important skill for a MechWarrior. Some of the weapons use ammunition, which is in limited supply. Others raise the heat inside a Mech. Furthermore, each weapon, whether it uses ammunition or energy from the fusion reactor, takes some time to ready. A pilot with a heavy hand on the trigger, firing all his weapons on every shot or firing when the weapons are not locked on, probably will end up out of ammunition, or waiting for weapons to recycle, or even shut down because of heat trouble... in other words, a perfect target.

Weapon selection is really three separate acts: understanding the characteristics of each weapon, trigger assignment, and trigger selection.

Accessing Weapons Data 04.04.01.01

Appendix 3: Weapons Data provides information about all the weapons generally mounted on a BattleMech. In the tables found there are data on the range, the heat released, the relative damage, and the recycle time of each weapon. For effective weapons management, a pilot should assimilate pertinent weapons data before combat.

Trigger Assignment 04.04.01.02

A pilot should reassign weapons to each of the three triggers on the *WJS-4* Joystick, thus customizing the trigger configuration to her fighting style. See Section 04.01.02. This, of course, is best accomplished before battle, when there is time to consider how the pilot's fighting style can best be served by appropriate trigger assignments. Still, pilots should not overlook the benefits to trigger reassignment during battle because of heat considerations, ammunition supplies, or range.

Trigger Selection 04.04.01.03

Based on the actual combat conditions, one trigger or another is likely to be the most effective. Selecting the trigger to fire is an art enhanced through practice and experience. General guidelines are obvious: fire weapons that have recycled, that have the appropriate range, that have available ammunition, and that do not bring heat trouble.

04.04.02 COMBAT SYSTEMS

04.04.02 Aiming Weapons

As with most war machines, aiming a BattleMech's weapons begins by acquiring the target on the Main Screen. Then the OrGran-Z Targeting Computer and the weapons Joystick can be used to pinpoint the shot.

A pilot must begin aiming by getting the target into position within the angle-of-view wedge shown on the Secondary Screen Radar. This positioning is usually done by jockeying the Mech around using the steering Foot Pedals. When the target is within the angle-of-view, it will be visible on the Main Screen if it is close enough.

04.04.02.01 Target Acquisition

When the *OrGran-Z* intelligent cross-hairs pulse toward the center, they indicate that a target has been acquired by the *ELIS* radar. Any shot fired when the cross-hairs are pulsing will hit automatically. If the cross-hairs are not pulsing, the shot will miss. Thus, as the target moves, it must be kept in the cross-hairs to have a successful hit.

When targeting terrain features, a pilot can simply line up the cross-hairs and shoot. The crosshairs will pulse when they are centered on any valid target. Only natural terrain features can withstand the massive amount of firepower a BattleMech can unleash. Any man-made object a pilot encounters can be destroyed.

04.04.03 Firing Weapons

To fire a weapon, a pilot need only press or pull one of the triggers on the *WJS-4* Weapons Joystick. Each weapon on a Mech should be preassigned to one of the triggers, and usually there will be more than one weapon assigned to a trigger. Pressing or pulling a trigger will fire all recharged weapons assigned to that trigger.

INFORMATION SYSTEMS 05.00.00

INFORMATION SYSTEMS OVERVIEW 05.00.00

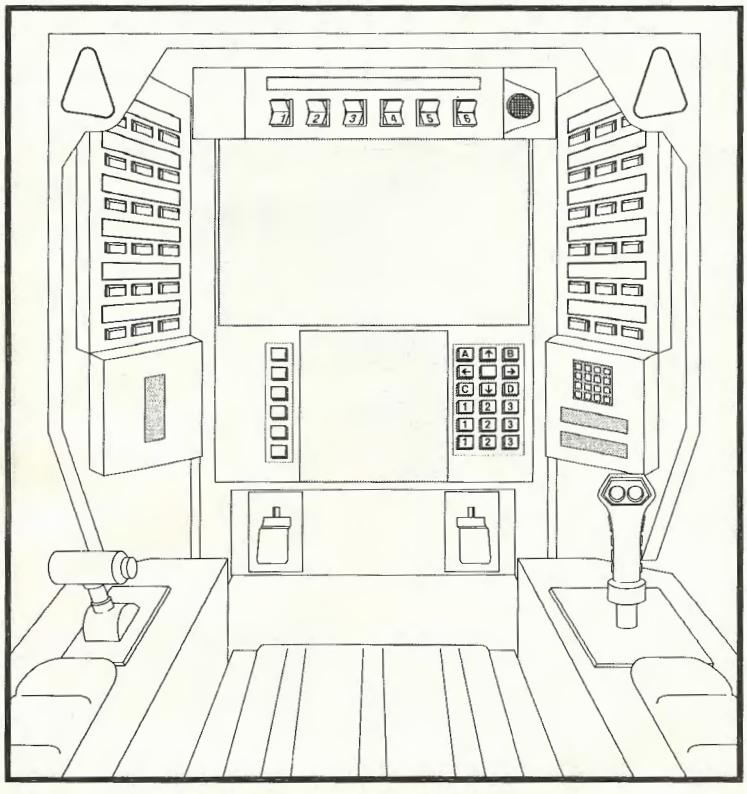
Systems Summary 05.00.01

The amount of information that a MechWarrior must review, assimilate, integrate, and act upon grows increasingly with each generation of BattleMechs. To handle the raw data that literally floods into a Mech every nanosecond, powerful cryogenically cooled super-microcomputer modules are networked into an information super-system. This network gathers, analyzes, and acts on the information input, mostly without interference from the human pilot. Information on movement, terrain, navigation, target acquisition, various scanning inputs, heat management, command/control communication, and life support are handled routinely by the Main On-Board Computer through its various System Modules.

An important function of a Mech's Information Systems is to analyze and report crucial data to the pilot, by means of a sophisticated set of displays. These range from video displays using various scanner data, navigation radar and map displays, target acquisition radar displays, communications displays, weapon data displays, heat management displays, and damage displays.

Definition 05.00.01.01

Information Systems are defined as those systems of the BattleMech that manage its data input and output. Included are systems that manage scanner signal aquisition, interpretation, and visual display; systems that gather and display data on the surrounding terrain, terrain features, and other Mechs; systems that manage communications and command/control data; and systems that manage heat build-up and dissipation.



Inventory 05.00.01.02

The Information Systems and Subsystems installed in the *Mark 7* are largely controlled or monitored by the Main On-Board Computer (MOBC), developed jointly by Defiance Industries and the MOBOSC development team. Among the various scanning functions controlled by the MOBC are the *Tru-Vu* Video Imaging System and its hardware, the *Hot-Spot* IR Imaging System, and the polarized xenon-osmium searchlight. Navigation and cadastral mapping functions, as well as damage control functions, are handled by the MOBC, which also provides

05.00.01 INFORMATION SYSTEMS

the various Secondary Screen displays. The MOBC is linked to the *HitPoint* Damage Control Module, the gyrocompass, the *Rangemaster* Mapping Computer, and the *ELIS* Rander Pinpoint Target Acquisition Radar. The *CommoPuter 8* Communications Computer module oversees all communications, including the *IM-Scan* IFF Broadcast Monitor and its links to the *Orgran-Z* Fire Control Computer and the *ELIS* Targeting Radar. The *ThermoSenz* Heat Management Module provides detailed information to the Pilot on heat build-up, and its auto-control feature frees the Pilot from having to deal with heat build-up.

05.00.01.03 **Categories**

For the purposes of this manual, Information Systems are divided into the following system categories:

scanner systems, including scanning devices and main visual displays;
navigation radar systems, including gyrocompass outputs, movement monitors, and terrain feature identification systems;
cadastral mapping systems, including grid-reference monitors and terrain feature analysis output;
damage control systems;
communication systems, including IFF scanners and broadcasters; and
heat management systems.

Related systems described elsewhere this manual include the following Combat Systems:

target acquisition radar systems;
weapon readiness detection systems; and
fire control systems.

INFORMATION SYSTEMS 05.01.00

MAIN SCREEN DISPLAY SYSTEMS 05.01.00

System Summary 05.01.01

The *Mark 7*'s Main Screen shows the view in a 60° arc at the front of the Mech's torso. This screen is not a window, but a display from a variety of video cameras enhanced by computer images from other scanner inputs. Maximum visibility on the Main Screen is slightly greater than a kilometer in clear weather, though bad weather or nighttime conditions can decrease this.

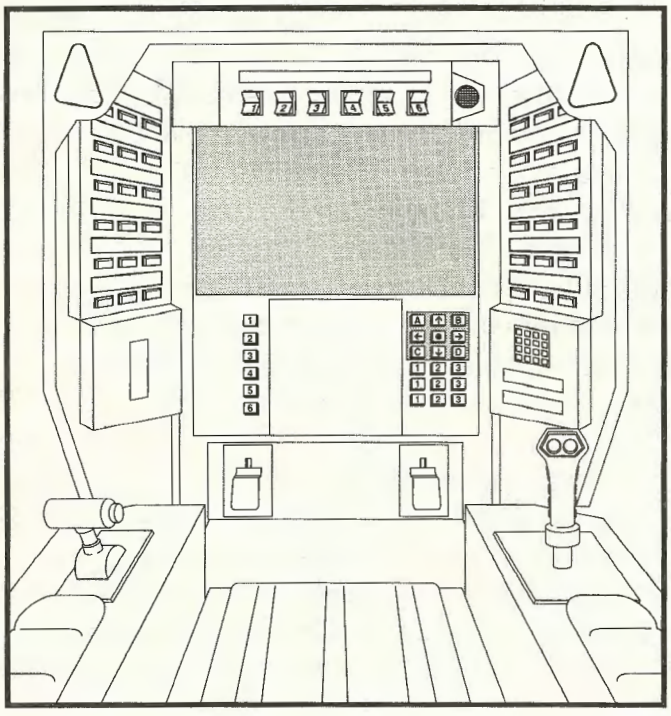
The Main Screen Display gets all of its information from the Main On-Board Computer, which enhances all images before displaying them. It shows enemy and friendly Mechs, buildings and vehicles, as well as natural terrain features and obstacles, and so it is the primary data input a MechWarrior uses to pilot his Mech. Not only is it used for piloting , but, because it has the firing cross-hairs displayed on it, the Main Screen is used for aiming the Mech's weapons.

Definition 05.01.01.01

The Main Screen Display Systems are defined as those systems that produce the visual display on the Main Screen of the *Mark 7* Cockpit. These include the scanning systems that pick up and convert ambient light and infra-red heat signatures. Other systems display their information on the Main Screen, but these systems are defined outside the Main Screen Display Systems for the purposes of this manual.

Inventory 05.01.01.02

Main Screen Display Systems installed in the *Mark 7* Cockpit include the *Tru-Vu* enhanced video camera and high-resolution display monitor as well as the *Hot-Spot Infra-Red Imaging System*. In addition, a powerful searchlight is considered as part of the Main Screen Display system. All Main Screen Display Systems are controlled by the Scanning Systems Control Panel to the right of the Secondary Screen.



Categories 05.01.01.03

For the purposes of this manual, Main Screen Display Systems are divided into the following systems categories, highlighted on the accompanying diagram:

- the video pick-up and display system, including the servo-controlled front camera array and the Main Screen itself;
- the scanner control systems;
- the infra-red emission detector, including the IR imaging computer; and
- the front-mounted, xenon-osmium searchlight.

05.01.02 INFORMATION SYSTEMS

Related systems described elsewhere in this manual include the following Combat Systems:

target acquisition radar and intelligent cross-hair displays; and
torso rotation control systems.

05.01.02 Main Screen Display Functions

The most common display function is the Enhanced Video Display, which is operational automatically when the Mech drops into battle, even at night-time. Less common is Infra-Red (IR) heat imaging, which must be activated by the pilot. The intelligent cross-hairs, though controlled by a separate Combat System, are displayed automatically as well.

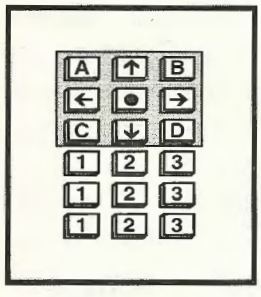
The Main Screen Display sensors are mounted on the upper torso. Thus, they face "forward" as determined by the orientation of the torso, and not as determined by direction of movement.

05.01.02.01 Scanning Systems Control Panel

The view shown on the Main Screen Display is controlled by the pilot. The aspect of view for all Main Screen Display functions (enhanced video, low-light video, and heat sensing) is controlled by buttons on the Scanning Systems Control Panel to the right of the Secondary Screen. The 60° view-angle left-and-right and up-and-down is determined by the attitude of the torso as determined by the Torso Control System currently active (either pushbutton control or joystick control).

The corner buttons on the Scanning Systems Control Panel toggle on-and-off the various scanning functions. Button "B" in the upper right corner toggles the Infra-Red Imaging System. Button "D" in the lower right corner toggles the powerful xenon-osmium ion-beam searchlight.

The center row of buttons and the center column of buttons form a cross in the center of this control panel. This is the Main Screen Aspect Control, and these buttons are red overprinted with black symbols. The button at top center, which has an upward pointing arrow, controls the servos that move the torso with its video cameras up. The button at bottom center, which has a downward pointing arrow, moves the torso and the video camera array down. The center button, marked with a dot, returns the torso and the camera array to the front-and-center default detent. The buttons to the left and right of center, marked with left and right arrows, control torso motion left and right, and thus the left-and-right aspect of the view field.



Of course, if the *WJS-4* Joystick has been enabled to control torso rotation and tilt, it will control the Main Screen Display's aspect-of-view as well.

05.01.02.02 Vertical Aspect-Of-View Monitor

The vertical aspect-of-view can be monitored at the bottom center of the Secondary Screen. There, a vertical graph displays the angle of torso-tip and thus the vertical view angle. The current view angle is shown as a red bar across the graph. When this bar is below the centerline of the graph, the torso is tipped down, and when it is above center, the torso is tipped up. The angle of tip can be estimated using the tick-marks at the side of the graph, which mark off every 10 degrees of inclination.

INFORMATION SYSTEMS 05.01.02

The Enhanced Video Display System 05.01.02.03

The *Mark 7* uses white-light images from an array of servo-controlled video cameras to produce the Main Screen Display. The video images from several cameras are merged and computer-enhanced to create an "out-the-front-window" display. The Enhanced Video Display system is enabled whenever a Mech joins a daylight or night battle. It is replaced with an Infra-Red Imaging System at the pilot's option.

Visibility with the Enhanced Video Display varies with battlefield conditions. In clear-weather, daylight conditions, the limit of visibility is about 1 kilometer. Fog or dust, of course, can diminish this range, as will night-time conditions.

Low-Light Searchlight Illumination 05.01.02.04

The Scanning Systems Control Panel has a button that controls a powerful searchlight mounted near the video camera array. This button is found in the lower left corner of the 9-button panel, where it is overprinted with a "D". Pressing this button toggles the searchlight on and off. Low-light sensors turn the beam on automatically when a Mech begins a night engagement, though a pilot may turn it off if she so desires.

The searchlight illuminates objects up to about 1 kilometer in the direction that the torso faces. Its lamp produces a beam of invisible radiation emitted by excited xenon hexa-osmium ions. The searchlight beam is polarized and fine-tuned it to the Main Screen camera display so that it is invisible to all other Mechs. Several of the video cameras are coupled to light-gathering lens systems, making them extremely sensitive to low light levels. Activating the xenon-osmium beam automatically couples the low-light sensitive cameras to lenses that only pick up the fine-tuned beam. The Main Computer combines and enhances the image, displaying it on the Main Screen.

The Infra-Red Imaging System 05.01.02.05

When an enemy Mech's camouflage makes it blend into the background, or when normal visibility is low due to fog or darkness, the normal video imaging system may be converted to an Infra-Red Imaging System. The *Hot-Spot* IR System color-codes the relative heat levels of the surrounding terrain and objects. Using infra-red imaging may allow a pilot to see hot objects more clearly.

When the IR System is turned on, the *Hot-Spot* IR system Mech sends out an infra-red beam that illuminates the objects ahead of you. What you see on your Main Screen will be illuminated according to the heat emitted. The image you see will graduate in color from black (the coldest objects) to bright green (the hottest objects). When a Mech is running very hot or is damaged, there is nothing hotter on the planet, and so he should be easy to see on IR. But if the MechWarrior has kept his heat down it may take some looking to figure out where he is. Learning to read the IR screen takes time, but it can become a very important tool.

In the upper right corner of the Scanning Systems Control Panel is a button that controls the IR Imaging System. This button is overprinted with a "B" and toggles the IR System on and off. The enhanced video system that normally creates the Main Screen view is disabled when the IR Imaging System is operational.

05.02.00 INFORMATION SYSTEMS

05.02.00 SECONDARY SCREEN DISPLAY SYSTEM

05.02.01 System Summary

The Mark 7 Cockpit design provides the wide range of sophisticated display systems that pilots need to take full advantage of the capabilities of today's BattleMechs. Every facet of modern warfare generates information that a pilot can use to good advantage, but only if 1) he has instant access when he wants it; and 2) if the display systems are clear enough to read at a glance; and 3) if access to the displays does not requre significant attention to be drawn away from the primary matter at hand... staying alive.

In the Mark 7, Defiance Industries has developed a Display System that integrates information input from a Mech's many sensor sources and displays it in a single location, the Cockpit's Secondary Screen. On this screen is displayed target location information from the ELIS Rander Pinpoint Target Aquisition Radar, position and movement information from the Rangemaster Cadastral Mapping Module, target identification and tracking information from the CommoPuter 8 Communications Module, and damage control data from the HitPoint Damage Control Module.

05.02.01.01 **Definition**

For the purposes of this manual, Secondary Screen Display Systems are defined as those systems that provide a display on the Secondary Screen, including displays that are selectable and those that are not.

05.02.01.02 **Inventory**

Secondary Screen Display Systems installed in the Mark 7 Cockpit include the Integrated Secondary Screen, which is coupled to the Function Selector Keys and the Display Soft Keys.

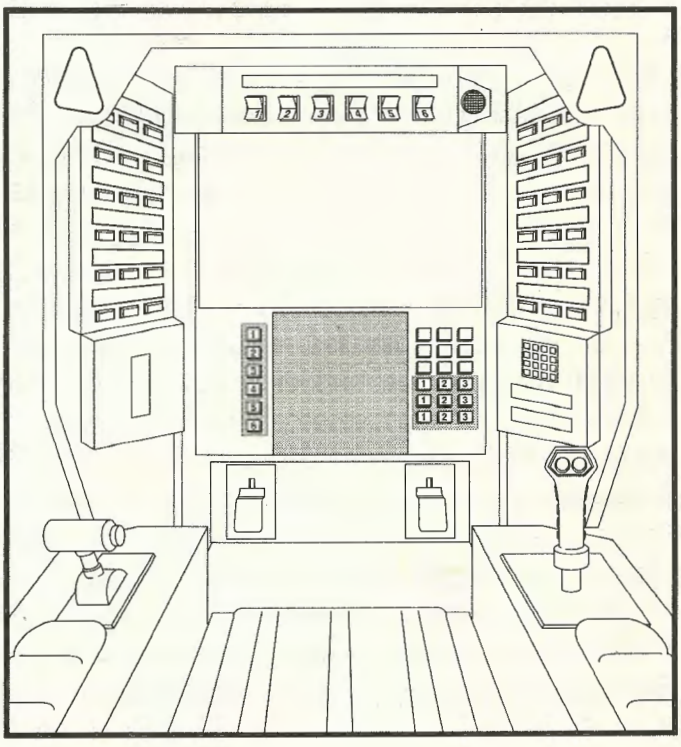
05.02.01.03 **Categories**

For the purposes of this manual, Secondary Screen Display Systems include the following hardware, highlighted on the accompanying diagram:

- the Display Selector buttons;
- the Secondary Screen Soft Keys; and
- the Secondary Screen.

Associated systems that provide information displayed on the Secondary Screen include the following:

- target acquisition radar systems, which provides the radar display including the visibility wedge;
- cadastral mapping systems,



which produces a satellite-fed ground map, a speedometer, and the compass heading displays;

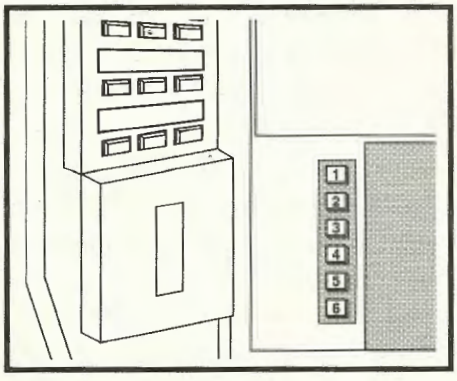
communication systems, which provides the target information and tracking displays;

damage control systems, which displays damage to the Mech; and

the Main On-Board Computer, which provides the Mech Data Bank display, symbol interpretation for the Secondary Screen map and radar displays (for novice pilots), and the Soft-Key function assignments (for master pilots).

Display Selector Functions 05.02.02

The Display Selector buttons are located just to the left of the Secondary Screen. These keys are used to select the data that will be displayed in the center of the Secondary Screen.



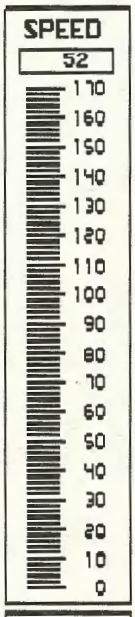
To select the Target Aquisition Radar Display, press Selector Buttton #1, at the top of the column. This will illuminate the button and bring up the Radar Display showing the Main Screen visibility wedge and the location of all Mechs in radar range.

To select the Cadastral Mapping Display, press Selector Buttton #2. This will light the button and bring up the Cadastral Map showing the Mech's location in relationship to surrounding terrain.

Display Selector Buttons #3-#6 are non-functional at this time.

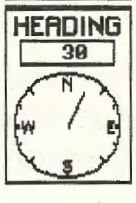
Secondary Screen Display Functions 05.02.03

Speedometer 05.02.03.01



A linear speedometer occupies the left side of the Secondary Screen, where a bar changes height in response to changes in tthe Mech's speed. At the top of the Speedometer, the speed is also digitally displayed in klicks per hour. Forward velocity is shown by an orange bar on the scale. Movement in reverse is indicated by a blue bar on the speedometer. This display is controlled by the Rangemaster Cadastral Mapping Computer Module.

Heading Compass 05.02.03.02



A heading compass occupies the lower left of the Secondary Screen, where a radial line changes attitude in response to changes in the Mech's bearing. At the top of the Compass Display, the bearing is also digitally displayed in degrees right from true North. This display is controlled by the Rangemaster Cadastral Mapping Computer Module.

Radar Display And Visibility Wedge 05.02.03.03

Display Selector Button #1 brings up the Target Acquisition Radar DIsplay, which shows all Mechs within the Mech's radar range. The Radar Display, along with the Main Screen visibility wedge, occupies the center of the Secondary Screen, and it is the major display when it is selected.

The Target Aquisition Radar Display and the visibility wedge are described in a separate Information Systems subsection.

05.02.03 INFORMATION SYSTEMS

05.02.03.04 **Cadastral Map**

Display Selector Button #2 brings up the Cadastral Mapping DIsplay, which shows the Mech's location in relation to the surrounding terrain. The satellite-fed Cadastral Map occupies the center of the Secondary Screen, and it is the major display when it is selected.

The Cadastral Mapping Display is described in a separate Information Systems subsection.

05.02.03.05 **IFF Display Functions**

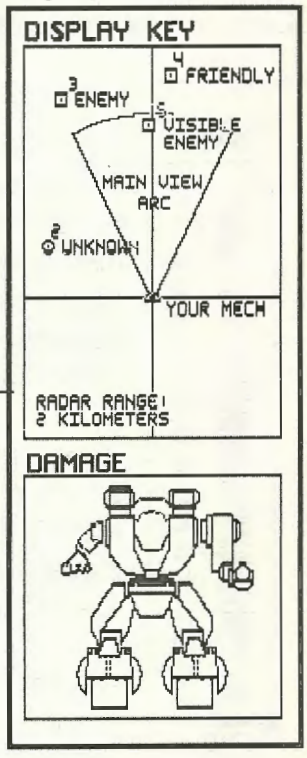
The IFF (Information Friend or Foe) Display is found at the bottom center of the Secondary Screen. This display lists the callsign and gives an indication of the direction to other BattleMechs. Like the Mech icons on the Radar Display, its information is color coded to indicate friendly Mechs (steady green) and enemy Mechs (flashing red).

IFF Display Functions are described in a separate Information Systems subsection.

05.02.03.06 **Secondary Screen Data Display**

The Screen Data Display occupies the right side of the Secondary Screen Display. In this location can be found several different kinds of information about the Secondary Screen.

At the top and center of this display are depicted the various functions of the 9 Secondary Screen Soft Keys and the 9 buttons of the Scanning Systems Control Panel, for ready reference. When Training Mode (see Section 06.01.00) is engaged, however, a Symbol Interpretation Display is found. This display, of great benefit to rookie pilots, provides a key to the symbols seen on the Radar Display (when it has been selected) or the Cadastral Map.



At the bottom of this display, in the lower right of the Secondary Screen, can be found the "Hot Box." This display, described below, has various functions which are accessed using the bottom row of Secondary Screen Soft Keys.

05.02.04 Secondary Screen Data Hot Box

The lower right corner of the Secondary Screen is reserved for variable data accessed by the bottom row of Soft Keys to the right of the Secondary Screen. Pressing one of the Soft Keys replaces the data currently displayed with one of the displays described below. The soft keys are deactivated in Training mode.

05.02.04.01 **Damage Display**

The Damage Control Display can be accessed by pressing Soft Key #2, in the center of the red bottom row. On this display is pictured the Mech, with external areas that have taken damage depicted in various colors to reflect the damage taken by the Mech. As damage gets progressively worse, the color of the external area damaged becomes first yellow, then red. When a limb has been shot off, it is no longer displayed. In training mode this is the default hot box display.

INFORMATION SYSTEMS

Target Tracking Display 05.02.04.02

The Target Tracking Display can be accessed by pressing Soft Key #3, at the right of the red bottom row. On this display are pictured the Mechs of all friendly and enemy pilots in the area. In addition, the callsign of each pilot is displayed as well as the Mech Type.

When Target Tracking Display appears, the frame around the "Hot Box" will become gold, and the Mech displayed will be tracked by the IFF System. On the Radar Display this Mech will be depicted with a gold box around the icon, allowing the pilot to to recognize it immediately when it appears on the Secondary Screen.

Secondary Screen Soft Key Functions 05.02.05

The bottom three rows of buttons to the right of the Secondary Screen are the Secondary Screen Soft Keys. These keys control the information displayed on the Secondary Screen.

Radar Range Controls 05.02.05.01

The top row of buttons, colored blue and numbered 1 through 3, controls the range on the Radar Display. Button #1, on the left, enlarges the scale viewed, making the area shown on the screen smaller and increasing the detail shown on the Mech icons. Repeated toggling of this button will cut the area depicted in half successively, down to a minimum size of a 250-meter radius. Button #2, in the center, resets the default range of 1 kilometer. Toggling Button #3, on the right, increases the scale, depicting increasingly larger areas to a maximum radius of 8 kilometers.

Map Scale Controls 05.02.05.02

The middle row of buttons, colored green and numbered 1 through 3, controls the scale of the Cadastral Map. Button #1, on the left, enlarges the scale viewed, making the overall area shown on the screen smaller but increasing the detail depicted. Repeated toggling of this button will cut the area shown in half successively, down to a minimum size of a 250-meter radius. Button #2, in the center, resets the default scale of 2-kilometer radius. Toggling Button #3, on the right, increases the scale, depicting increasingly larger areas to a maximum radius of 16 kilometers.

Secondary Screen Data Hot Box Controls 05.02.05.03

The bottom row of buttons, colored red and numbered 1 through 3, controls the information displayed in the Hot Box at the lower right of the Secondary Screen. Button #2, in the center, toggles the Damage Control Display, described in Section 05.05.00. Toggling Button #3, on the right, brings up the Target Tracking Display, described above.

05.03.00 INFORMATION SYSTEMS

05.03.00 NAVIGATION RADAR SYSTEMS

05.03.01 Systems Summary

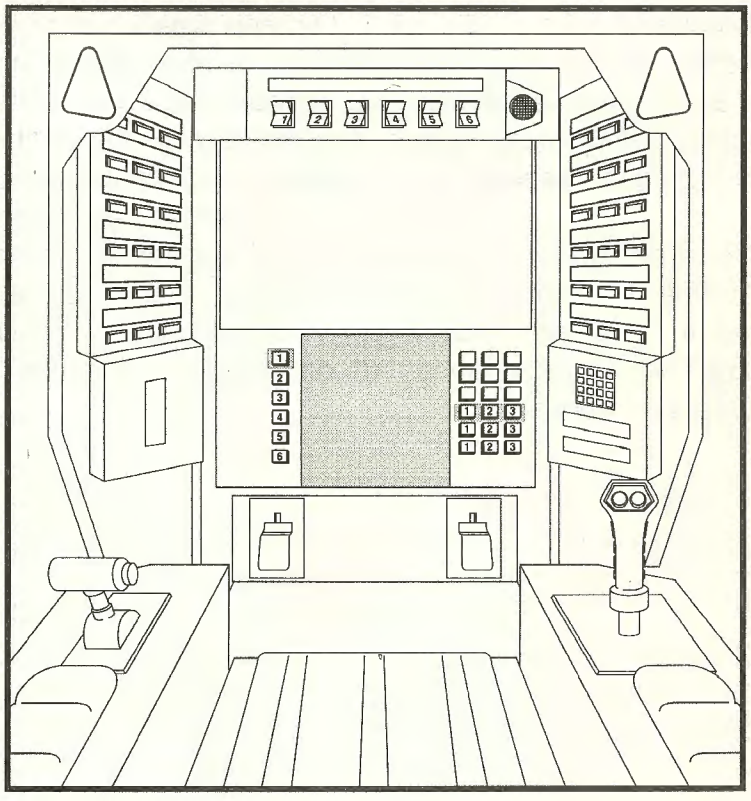
The *Mark 7* incorporates a state-of-the-art radar system with a very sophisticated on-board computer to provide the MechWarrior pilot with a wide variety of information. Some of this information is displayed on the Main Screen, where it is incorporated into the enhanced video display and is integral to the intelligent targeting cross-hairs. A radar scan image can also be displayed on the Secondary Screen below the Main Screen.

05.03.01.01 **Definition**

For the purposes of this manual, Navigation Radar Systems are defined as those systems that process and display navigation information from the *ELIS* Rander Pinpoint Acquisition Radar. Information from the *ELIS* Radar that is used to target opponents is covered in Section 03: Combat Systems. Navigation information includes distance/bearing information and radar "blip" interpretation, as shown on the Secondary Screen Radar Scan, and also range information as shown above the targeting cross-hairs.

05.03.01.02 **Inventory**

Installed in the *Mark 7* Cockpit is the *ELIS* Rander Pinpoint Acquisition Radar System, which is linked to the Secondary Screen Display by means of the Main On-Board Computer as controlled by the Secondary Screen Soft Keys, highlighted in the diagram below. This Radar System is also linked to the Main Screen Display and the *WJS-4* Joystick by the *Orgran-Z* Fire Control Computer, as described in Section 3 of this manual.



05.03.01.03 **Categories**

For the purposes of this manual, the Navigation Radar Systems are divided into the following categories:

- target ranging systems;
- radar sweep imaging systems; and
- radar sweep display soft key control system.

Related systems described elsewhere in this manual include the following systems:

- IFF target identification systems; and
- target acquisition radar and intelligent cross-hair displays.

INFORMATION SYSTEMS 05.03.02

Main Screen Target Ranging Functions 05.03.02

On the Main Screen Display, just above the targeting cross-hairs, is displayed the range to any valid target. This ranging function is provided to pilots as a means of gaining accurate range information. It is part of the "intelligent" nature of the targeting cross-hairs.

Secondary Screen Radar Sweep Display Functions 05.03.03

When the Mech comes on line, the Secondary Screen will be set to show a radar sweep with a range of 1 kilometer. On this display, the Mech is depicted as a tiny circle at the center of the screen. Other Mechs are shown as icons, but objects such as buildings, vehicles, and natural terrain features are filtered out by the on-board computer so that a pilot can tell exactly where her friends and enemies are in relation to her Mech.

When a pilot steers her Mech, instead of an icon representing her Mech moving across the radar sweep, everything else moves while her position remains the same. As she moves forward, the icons for other Mechs should move lower and lower on the screen. If she moves backward, they should move higher. Steering right or left will cause the icons to rotate in the direction opposite her turn. Thus, if she turns right or rotates her Mech's torso to the right, the icons on the radar screen will rotate counterclockwise around her, and if she turns left or rotates the torso left, the other Mech icons will rotate clockwise about her.

Visibility Wedge 05.03.03.01

The blue lines that form a wedge shape extending from the center of the radar sweep show the 60° angle-of-view of the Main Screen Display. The length of the wedge side depends on battlefield conditions. In clear daylight, objects up to 1 km can be seen on the Main Screen Display, and so the wedge is 1 km from point to outside edge.

The location of the visibility wedge on the radar sweep is determined by the rotation of the torso with respect to the front of the Mech. If the torso is facing front-and-center, the visibility wedge opens toward the top center of the Secondary Screen. If the torso is twisted to the left, the visibility wedge is rotated to the left.

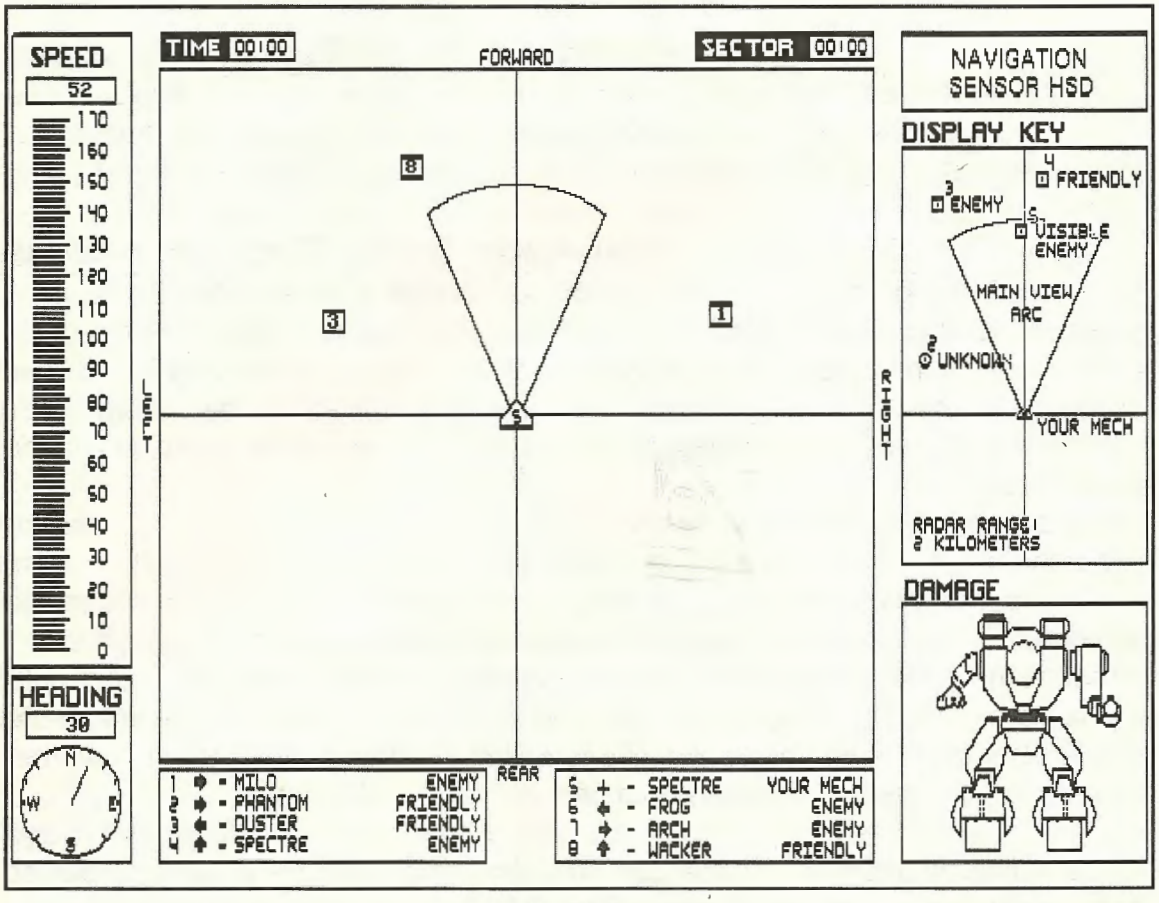
Mechs with icons within the visibility wedge are probably visible on the Main Screen Display. The closer they are to the point of the wedge, the larger they will be on the Main Screen. In combat, a pilot will use a combination of foot-pedal movement and torso rotation to bring enemy Mech icons into the visibility wedge and onto the Main Screen Display for targeting.

Range Control Soft Keys 05.03.03.02

When a Mech comes on line, its Navigation Radar is operative. During the course of battle, however, many pilots use the BattleMap display from time to time. Toggling back to the Radar Sweep Display from the BattleMap Display is easily done by pressing Secondary Screen Selector Button #1, which is top button in the column to the left of the Secondary Screen. Pressing this button will replace the BattleMap with the Radar Sweep and the Soft Keys with the keys that control the radar's range.

The default range for the Radar Sweep is 1 kilometer in training mode and 0.5 km for advanced operations mode. The minimum range is 250 m, and the maximum range is 8 km. The second row of Soft Keys to the right of the Secondary Screen are

05.03.03 INFORMATION SYSTEMS



used to set the range. The button on the left, overprinted with a "1," reduces the range by half each time it is pressed until the minimum range of 250 m is reached. The button on the right, overprinted with a "3," doubles the range until the maximum range of 8 km is reached. The button in the center, overprinted with a "2," returns the range to the default setting of 1 kilometer. The range adjustment soft keys are disabled in training mode.

05.03.03.03 **Mech Icons On Sweep Display**

Mechs are displayed as icons color-coded by the Main Computer to correlate with IFF data, showing as a steady green for friendly Mechs and as flashing red for enemy Mechs. When the radar range is 2 km or less, Mech icons look like Mech top views. At short range, therefore, it is easy to see the direction of movement of all Mechs within range. At ranges of 4 or 8 kilometers, however, the icons are squares, and direction of movement is not shown.

INFORMATION SYSTEMS 05.04.00

CADASTRAL MAPPING SYSTEMS 05.04.00

Systems Summary 05.04.01

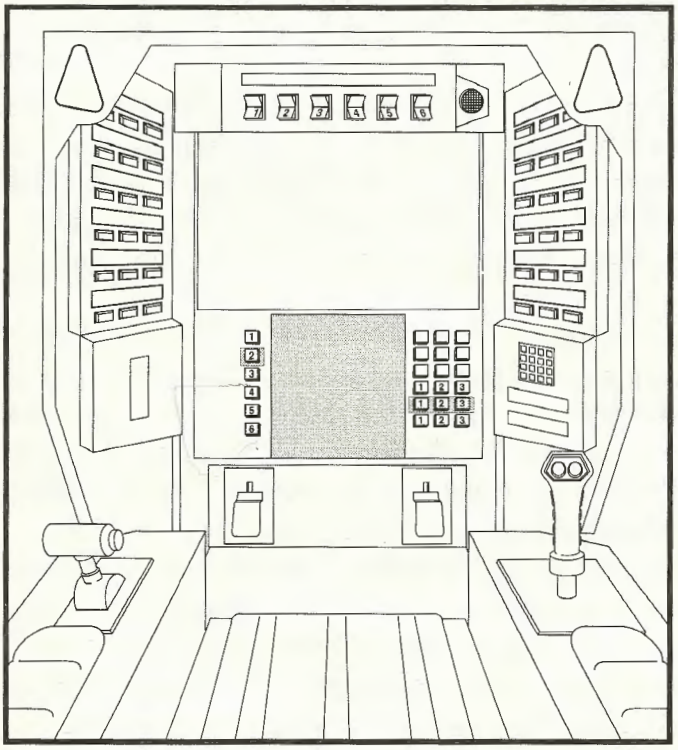
The *Mark 7* incorporates a state-of-the-art radar system with a very sophisticated on-board computer to provide the MechWarrior pilot with a wide variety of information. Some of this information is interpreted and displayed as a map on the Secondary Screen below the Main Screen.

Definition 05.04.01.01

For the purposes of this manual, Cadastral Mapping Systems are defined as those systems that process and display maps showing the Mech's location with respect to the Planetary Grid System. Information from the *ELIS* Rander Pinpoint Acquisition Radar that provides a standard radar sweep is covered in another part of this section, and information from the *ELIS* Radar that is used to target opponents is covered in Section 03: Combat Systems. Cadastral Mapping information includes distance/bearing data, Cartesian coordinate planetary grid mapping, and radar target interpretation, as shown on the Secondary Screen BattleMap.

Inventory 05.04.01.02

Installed in the *Mark 7* Cockpit is a liquid diamond gyrocompass slaved to the gyro in the Mech body. It is also linked to the *Rangemaster Computer* subsystem that keeps track of the Mech's location with respect to the Planetary Grid System relayed to the Mech from orbiting satellites. The data from the Rangemaster System is displayed as a grid coordinates on the BattleMap, as an overall grid map that can be displayed on the Information Systems "Hot Box" in the lower right corner of the Secondary Screen, and as a compass rose showing the Mech's current bearing in the lower left corner of the Secondary Screen.



In addition, the *ELIS* Rander Pinpoint Acquisition Radar System is installed in the *Mark 7*. This radar is linked to the Secondary Screen Display and is controlled by the Secondary Screen Soft Keys, highlighted in the diagram below. Output from this Radar System is interpreted by the Cadastral BattleMap Computer subsystem of the Main On-Board Computer.

Categories 05.04.01.03

For the purposes of this manual, the Cadastral Mapping Systems are divided into the following categories:

- gyrocompass systems;
- coordinate grid computer systems;

05.04.02 INFORMATION SYSTEMS

radar target interpretation computer systems;
bearing, planetary grid, and cadastral battlemap imaging systems; and
map scale soft key control system.

Related systems described elsewhere in this manual include the following systems:
IFF target identification systems;
target acquisition radar systems.

05.04.02 Gyrocompass Bearing Display Functions

At the bottom left of the Secondary Screen is displayed a green compass rose. Oriented in the traditional way with north at the top, this rose displays the Mech's current direction of travel (as determined by the way its feet face) as a red arrow radiating out from the center of the rose. This corresponds to the direction of travel indicated on the BattleMap. Above the rose, the Mech's current bearing is displayed in degrees clockwise from north.

05.04.03 BattleMap Display Functions

When the Mech comes on line, the Secondary Screen will be set to show a radar sweep with a range of 1 kilometer. The pilot can quickly replace this with the BattleMap Display by pressing Secondary Screen Control Button #2 to the left of the Secondary Screen. This button brings up a map showing the 2-kilometer-square area immediately surrounding the Mech.

The pilot's Mech appears as a yellow, triangle in the center of the BattleMap. When the pilot steers his Mech, the yellow icon turns right and left to show his direction of travel, which is toward the point of the icon. If he steers to the right, the triangular icon will rotate right. If he steers to the left, the icon will rotate left.

Even though his Mech moves forward, its yellow icon remains in the center of the BattleMap. It is the other objects displayed on the BattleMap that move instead. The faster he moves, the faster the objects on the BattleMap move. The location of objects is shown by their changing positions on the BattleMap.

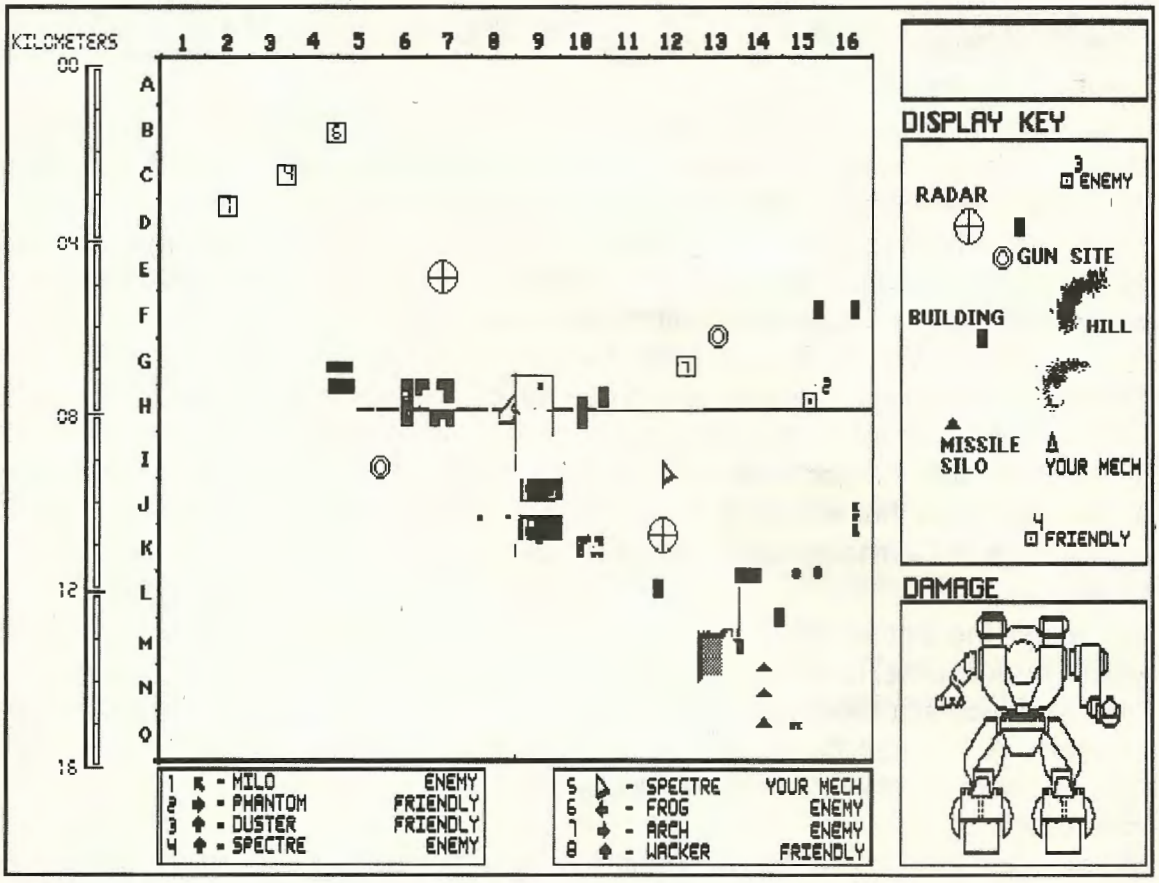
Whereas the only objects that appear on the radar sweep are BattleMechs and things such as buildings, vehicles, and natural terrain features are filtered out by the on-board computer, these useful items are placed in their correct positions on the BattleMap Display. A disadvantage is that, when the BattleMap Display is enabled, there is no way for a pilot to correctly determine the way his Mech's torso is twisted.

05.04.03.01 BattleMap Scale Soft Keys

The default scale for the BattleMap provides an area of view 4 km^2, with the Mech in the center of the map square. The minimum scale gives a view 250 meters square, and the maximum scale gives a view 256 km^2. Of course, the larger the scale, the smaller the area shown on the BattleMap. The smaller the scale, the larger the area shown on the BattleMap. Conversely, the larger the scale, the more the detail shown, and the smaller the scale, the less the detail shown on the map.

The second row of Soft Keys to the right of the Secondary Screen are used to set the map scale. The button on the left, overprinted with a "1," doubles the map scale and reduces the area mapped by half each time it is pressed until the 250-m-square minimum area is reached. The button on the right, overprinted with a "3," cuts the map scale in half each time it is pressed, until the 256-km-square maximum area is

INFORMATION SYSTEMS 05.04.03



reached. The button in the center, overprinted with a "2," returns the scale to the default setting, which provides a map 2 km square.

BattleMap Icons

05.04.03.02

Icons appear on the screen to indicate locations of all buildings, paved areas, vehicles, Mechs, and even natural terrain features within the map area. Mech icons are squares color-coded by the Main Computer to correlate with IFF data, showing as a steady green for friendly Mechs and red for enemy Mechs. To the upper right of the Mech icons is a number that corresponds to the Mech cockpits listed in the IFF Display at the bottom right of the Secondary Screen. When Training Mode is enabled, a map key that appears in the upper right of the Secondary Screen shows the icons for other objects.

When the area mapped is 4 km square or less, the icons displayed show the Mechs' direction of travel. Differences in the icon shape and appearance also show the Mech type or version.

05.05.00 INFORMATION SYSTEMS

05.05.00 COMMAND/CONTROL COMMUNICATION SYSTEM

05.05.01 System Summary

The Command/Control Communication System includes the systems that a MechWarrior pilot needs to keep track of his lance and other friendly forces, as well as of any enemy forces in his area. Incorporated into the communication system is a scanner subsystem that is coupled with a computer module that analyzes and controls auto communications and the laser/microwave radio systems that allow voice contact up and down the chain of command. This system constantly monitors the RF, VHF, UHF, ELF, and MWF bands for encoded transmissions that are important for battlefield command and control. It conveys the broadcast information it receives to the pilot via the cockpit speakers or optional headphones and via the IFF (Identification Friend or Foe) Display on the Secondary Screen. The system also broadcasts code that will allow friendly Mechs to identify this Mech and its pilot.

05.05.02 Intra-Lance Command/Control Radio System

05.05.02.01 Overview

While on the battlefield, a pilot must be able to communicate with the other MechWarriors in her lance to coordinate her actions. The *Mark 7* cockpit has a noise-filtering, voice-actuated microphone mounted on the right side of the Overhead Console. A headset broadcasts incoming voice messages; a headset with an attached microphone is an optional feature.

05.05.02.02 Inventory

At the heart of the Intra-Lance Command/Control Radio system is the *CommoPuter 8* Communications Computer module, which combines scanner data analysis with message encryption/decryption functions. Other hardware include a voice-actuated microphone and several speakers. Microphone output is Double-Dolby filtered by the *CommoPuter 8* before being passed through encryption.

Broadcast is via LOS communication lasers or narrow-beam, limited range microwave bursts. Selection of broadcast mode is pre-programmed and controlled by the *CommoPuter 8* so that the pilot need not concern herself with actual mode selection.

05.05.02.03 Radio Functions And Operation

To transmit, the pilot merely needs to speak. The *CommoPuter 8* computer module will recognize the voice message, automatically suppressing other cockpit noise via the Double-Dolby circuitry and software. The *CommoPuter 8* will then encrypt the message and, depending on battlefield conditions, it will broadcast the encrypted voice message as a laser burst or a microwave burst.

Incoming communications bursts of either type are received by the Command/Control Computer Systems scanners. They are decrypted by the *CommoPuter 8* and passed on to the pilot via the pilot's headset.

INFORMATION SYSTEMS 05.05.03

IFF (Identification Friend Or Foe) Scanner System 05.05.03

Overview 05.05.03.01

The IFF Scanner System differentiates friendly and enemy forces using signals normally broadcast by each Mech. When a Mech comes on line, its IFF system is active. This means that it is continuously sending coded broadcasts that will identify the Mech to all friendly forces in the area.

The IFF Scanner System in each interprets incoming signals and communicates its analysis to the Main On-Board Computer, which integrates it with targeting radar information for several displays to the pilot.

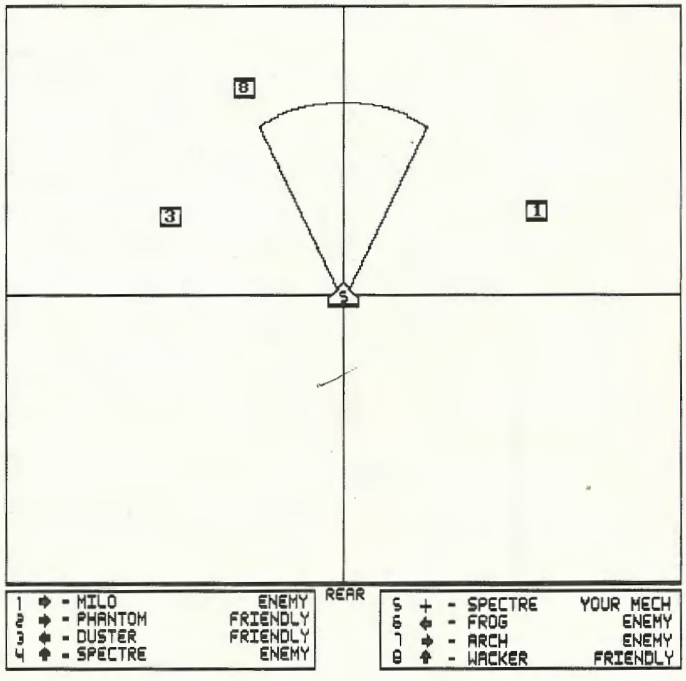
Inventory 05.05.03.02

The IFF Scanner System is an integrated hardware-software package incorporating a scanner and a computer. The system is driven by the *CommoPuter 8* module, which gathers data from the cockpit's *IM-Scan* IFF Broadcast Monitor and analyzes it. The *CommoPuter 8* passes its analysis to the Main Computer, which integrates it with information from the *OrGran-Z* Fire Control Computer and displays the composite on the Main Screen and the Secondary Screen.

IFF Scanner System Functions 05.05.03.03

On the Main Screen, information from the IFF Scanner System allows the Main On-Board Computer to display the call-sign of the target pilot. Whenever the *ELIS* Targeting Radar has locked onto a Mech, the cross-hairs will pulse and the targeted pilot's call-sign will be displayed in red below the cross-hairs. This display is made possible because of friendly IFF broadcasts and because of data-match with enemy Mech broadcasts and energy emission signatures.

On the Secondary Screen map and radar displays, information from the IFF Scanner System appears as different icons, allowing the pilot to locate other members of her lance and any enemy Mechs on the battlefield. Friendly Mechs are displayed as green icons with a cockpit ID number. Enemy Mechs are displayed as flashing red icons, also with a cockpit ID number.



In addition, output from the *CommoPuter 8* is displayed directly on the IFF Display at the bottom of the Secondary Screen. The IFF Display shows each cockpit ID number, gives the call-sign. . As with the icons on the Secondary Screen radar and map displays, friendly Mechs are shown in green and enemy Mechs flash red.

05.06.00 INFORMATION SYSTEMS

05.06.00 HEAT MONITORING SYSTEM

05.06.01 System Summary

Every weapon generates heat; the more powerful the weapon, the more heat it generates. A BattleMech is able to dissipate heat fairly rapidly, but firing weapons can cause heat build-up. If a Mech gets too hot it will have problems that range in seriousness from speed loss, through target acquisition radar failure, to shut-down and possible explosion.

05.06.01.01 Inventory

The *Mark 7* Cockpit is equipped to handle heat build-up with the Heat Monitoring Module of the Main Computer, which constantly monitors the heat in various parts of the Mech. It analyzes this data and displays a composite as an indication of the overall heat build-up and dissipation in the Mech. The Heat Display on the left panel gives an indication of the danger.

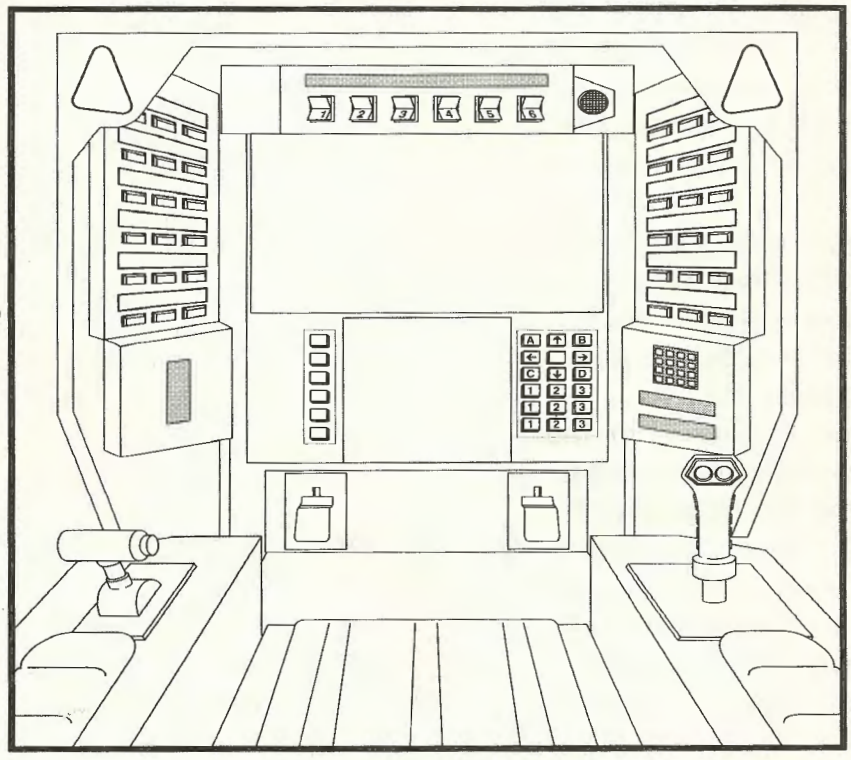
05.06.01.02 Categories

For the purposes of this manual, Heat Monitoring Systems include the following:

heat sensors;
automatic heat management computer module;
graphical heat display systems;
automated fusion-engine shut-down and warning systems;
main computer override systems; and
ammunition jettisoning control systems.

Related systems described elsewhere in this manual include:

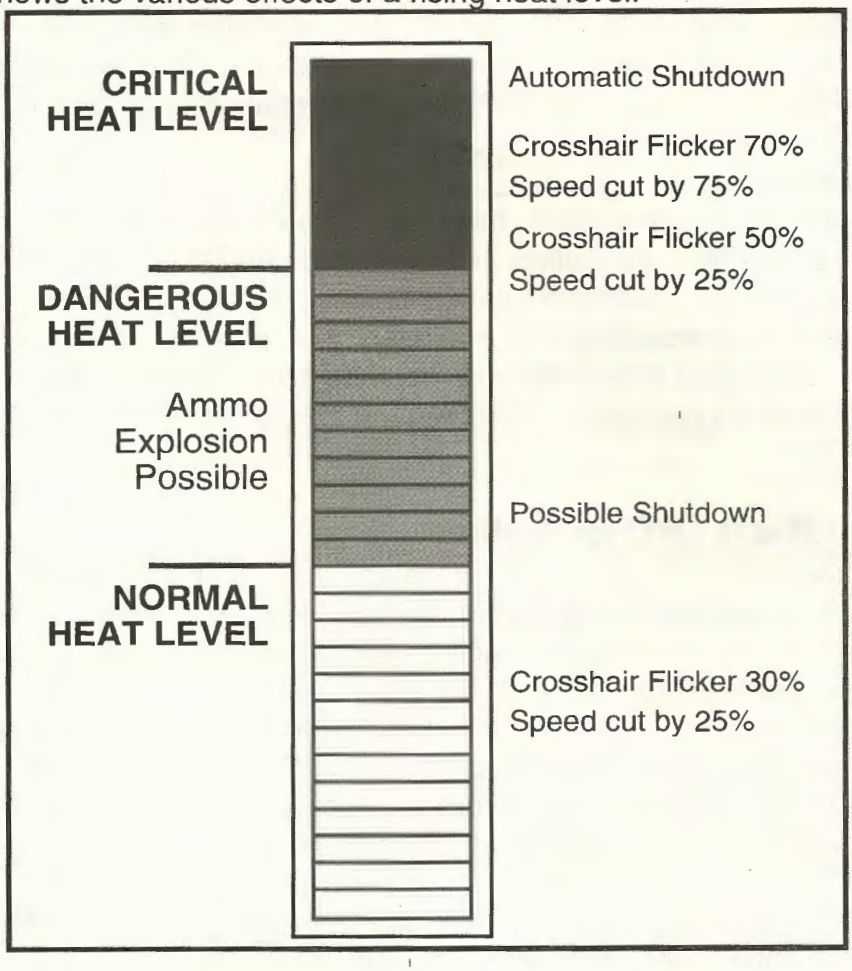
weapon display systems, including trigger assignment buttons.



INFORMATION SYSTEMS 05.06.02

Adverse Effects From Excessive Heat 05.06.02

It is imperative that a pilot constantly monitor his Mech's heat build-up. As its heat climbs to critical levels, a Mech loses control over vital functions. The accompanying diagram shows the various effects of a rising heat level.



ADVERSE EFFECTS FROM EXCESSIVE HEAT

Engine Efficiency Reduction And Top Speed Loss 05.06.02.01

The first adverse effect from too much heat is engine efficiency, which directly affects the Mech's top speed. The lowermost readout provides a constant monitor of engine efficiency. As it drops, the percentage of top speed is displayed. The Mech will move more slowly for any given throttle setting until sufficient heat is dissipated.

Radar Function Loss 05.06.02.02

The second adverse effects usually are seen on the targeting cross-hairs, which begin to flicker. Target identification and ranging functions are lost, and automatic lock-on is impossible. Weapon fire is still possible, of course, though there is no way to insure that the cross-hairs are locked on a viable target.

As heat continues to build, the Secondary Screen map and radar displays are affected. First they flicker, and then they cycle between the various options randomly. Without adequate engine function or targeting radar function, the overheated Mech becomes a sitting duck, and almost irresistable target.

05.06.02 INFORMATION SYSTEMS

05.06.02.03 **Fusion Engine Shut-Down**

If the heat continues to build, the fusion plant's magnetic sphere will start to overheat and its computer will try to shut the engine down. The On-Board Computer gives warning with a klaxon sound and a message on the Main Computer Message Center above the Main Screen. Depending on the amount of heat that the Mech has built up, the pilot may have as long as 9 seconds or as short as 3 seconds to take action before all systems are shut down and the Mech is totally defenseless. How to avoid computer shut-down is described below.

05.06.02.04 **Ammunition Explosion**

If the temperature is high enough, the projectile ammunition carried by the Mech may catch fire. Machine gun bullets and long-range and short-range missiles may explode. When the Main Computer senses a fire in the ammunition stores it issues a warning heard as a repeating horn and seen as a repeating flash on the Weapon Display. The pilot has at most 6 seconds to jettison the burining ammunition before the fire will cause an explosion destroying the Mech. How to do this is described below.

05.06.04 Handling Effects Of Overheating

Of course, the mark of an expert pilot is the ability to handle the heat build-up in his Mech. This is accomplished by judicious use of heat-producing weapons, easily accomplished by efficient trigger selection, which allows a pilot to fire some of the ready weapons without firing all of them.

Once a Mech becomes overheated, however, and its systems begin to fail or be locked out by the Main Computer, the pilot should allow his Mech to cool down. This ordinarily means disengaging from combat as quickly as possible, and remaining out of combat until the Mech is cool and fully functioning.

Still, in the "heat" of battle, even master pilots get into heat trouble. The Heat Management Systems of the *Mark 7* allow such pilots to avoid computer shut-down of the fusion engine and to dump burning ammunition.

05.06.04.01 **Avoiding Automatic Shut-Down**

When the heat buildup in her Mech is great enough that functions will shut down automatically, the pilot has a chance to avoid this. When she is alerted by the klaxon or message on the Overhead Message Center that the Main Computer has initiated shut-down procedures, she has some time to act. The Main Computer will have displayed a Shut-Down Avoid Code and a count-down on the Computer Readouts, found on the right just below the Main Computer Keypad. These are shown in the accompanying diagram.

The pilot must correctly type the 4-character, Shut-Down Avoid Code into the Main Computer Keypad before the count-down is completed. As the heat level gets higher, the amount of time to give a correct response gets shorter. As each character is correctly entered, it is no longer displayed on the Readout.

Avoiding shut-down is only a temporary solution, because it does not dissipate any

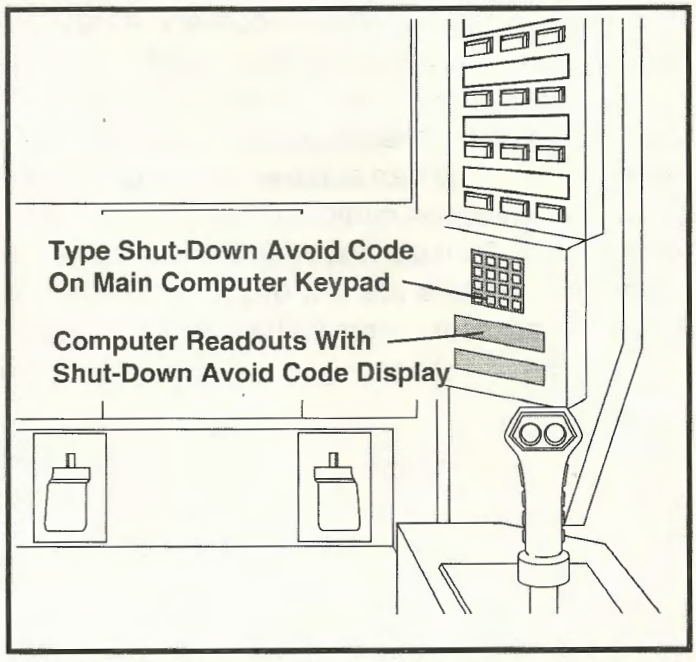
heat. Of course, the engine may no longer allow the Mech to move, and the targeting radar may no longer function, and so the Mech may cool down on its own as long as the pilot just waits.

Jettisoning Ammunition To Avoid Explosion

05.06.04.02

When there is a fire in an ammunition bay, the pilot may dump the ammunition there. After he is alerted to a fire by a rhythmic beeping, he should look for the Weapons Display that is blinking, because this is the ammunition that is ready to explode.

Pressing all of the three trigger selector buttons at the same time will dump the ammunition for a weapon. The lights in the buttons will go out, and the weapon will no longer be operational, because it will have no ammunition. The danger of explosion will have passed, however. If there is relatively little ammunition left in the burning ammo bay, a pilot may have enough time to fire it all before an explosion occurs. This method of avoiding explosion is not as certain, but it, too, alleviates the problem when it works.



AVOIDING SHUTDOWN OR EXPLOSIONS

Often ammunition fires accompany an automatic shut-down, usually preceeding it. Avoiding them is far more pressing than avoiding shut-down, and master pilots have developed their reflexes to dump ammunition as soon as they hear the rhythmic beeping that signals trouble.

APDX.01 BACKGROUND INFORMATION

A01.01.00 BATTLETECH UNIVERSE SITUATION SUMMARY

The year is 3029. Man has fulfilled his dream and colonized the stars, and yet war between worlds rages on. The expanse of the universe has given man only more opportunity for conquest and betrayal, for treachery and defeat. The wealth and promise of a unified race have been uplifted and shattered, and the ideals of both technology and brotherhood have been smashed.

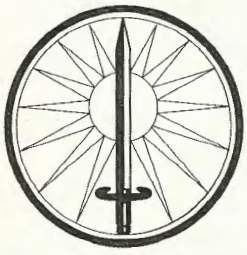
A Dark Age has engulfed the Human Sphere, the result of more than two centuries of bitter war. Where once a united Star League ruled the stars, splinters now struggle for dominion. Five separate Successor States have emerged, each ruled by a single family that has reigned over their hundreds of worlds for hundreds of years.

Known as Houses, each of these empires controls vast resources, countless people, and near-limitless possibilities. Each seeks mastery and control over all the universe, but none can conquer unaided, and none can be trusted as an ally. Thus campaign succeeds campaign, and battle follows battle without lasting victory or telling defeat. Men die and worlds are smashed, but the wars go ever on, and many once fertile planets are but desolate wastelands that silently condemn the Inner Sphere Successor Lords' inability to coexist peacefully.

BACKGROUND INFORMATION APDX.01

THE FIVE HOUSES A01.02.00

House Davion A01.02.01



The Federated Suns

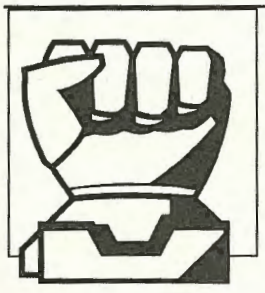
The Federated Suns is the most powerful Successor State of the Inner Sphere. It is ruled by Hanse Davion, known as "The Fox" for his brilliant and often deadly campaigns, both in the political arena and on the battlefield.

House Kurita A01.02.02

The Draconis Combine

The ancient code of Bushido lives on in the Draconis Combine, the Inner Sphere's second largest military power. Ruled by Takashi Kurita, a man ruthless in his vengeance, House Kurita has killed whole planets to appease his honor.

House Steiner A01.02.03



The Lyran Commonwealth

The Lyran Commonwealth has the strongest economy of the Inner Sphere, but its military has never excelled. Katrina Steiner rules with a longer vision than other leaders, as attested by her daughter's recent marriage to Hanse Davion.

House Liao A01.02.04

The Capellan Confederation

The Capellan Confederation has been an active antagonist of The Federated Suns for years. Its leader, Maximilian Liao, demands and receives an almost fanatical devotion from his subjects.

House Marik A01.02.05

The Free Worlds League

The Free Worlds League has been plagued by political infighting for years. Several factions within House Marik have individual agendas, fueled covertly by Hanse Davion, that hamper the progress of the League as a whole. Janos Marik has worked years just to get them all to start talking.

APDX.01 BACKGROUND INFORMATION

A01.03.00 THE WARRIORS

A01.03.01 MechWarriors

All who pilot BattleMechs and AeroSpace Fighters in the Succession Wars are professional soldiers, members of a hereditary warrior class. Their families form a small, powerful elite within each of the societies of the Successor States, and they guard their position with jealous vigor.

The children of these military families are raised from birth to be MechWarriors. From the time they are old enough to talk, they are steeped in electronics, engineering, strategy, and tactics. The high level of manual dexterity and hand-eye coordination required are developed by drill and constant practice on electronic simulators. Those children who do not measure up are shunted aside, to serve as Techs (Mech technicians), estate managers, or household guards. The best are taught to pilot both BattleMechs and AeroSpace Fighters. They are kept in constant readiness for the day when they will succeed their elders on the battlefield.

Over the centuries, the MechWarrior families have gathered more and more power. By the beginning of the 31st century, most own large estates supported by many servants. Colonels and Captains are correspondingly richer, and Regimental Commanders often own estates worked by thousands of civilians. In fact, many MechWarriors have been raised to the nobility by the Successor Warlords. In return for their privileges and wealth, the MechWarrior families guarantee protection to their tenants, swear allegiance to their officers, and owe fealty to one of the five Successor Warlords.

A01.03.02 Mercenaries

The Succession Wars era is the ideal setting for mercenary operations. It is an age of continual warfare, with talented soldiers and military hardware in short supply. With an even balance of power among potential employers, and with widespread social, economic, and political stagnation negating dramatic causes or sweeping principles of right and wrong, professional warriors can offer their combat services to the highest bidder, untroubled by conscience.

Thus, independent mercenary units, varying widely in size and quality, add their combat skills and essential hardware to many a battlefield. Though each House can field large numbers of regular troops, every one has found it necessary to hire mercs. Still, no merc wants to see any Successor State upset the balance of power by winning decisively over the other four, because this could put the mercenary on the 'wrong' side and so end his lucrative career.

BACKGROUND INFORMATION APDX.01

MILITARY ORGANIZATION A01.04.00

BattleMech armies are organized into combined outfits containing BattleMechs of all tonnages, AeroSpace Fighters, and transport DropShips.

The basic structure of a BattleMech regiment is triangular in that it is made up of smaller units in multiples of three. After several hundred years of BattleMech warfare and tactical experimentation, a standard organization has evolved. In practice, though all the units in the Successor States follow this model, few are well-enough equipped to conform exactly to it.

The standard BattleMech unit is a regiment, successively broken down into battalions, companies, and lances. Each of these levels of organization is discussed below, from smallest to largest.

Lance A01.04.01

The smallest BattleMech unit is the lance. The equivalent of a 20th-century tank platoon, it contains four BattleMechs, four MechWarriors, and four Techs. Lances of various tonnage have specific mission, from reconnaissance to fire support to assault. As with most other units smaller than a regiment, a lance is most often labelled with its commander's name; if, for example, a BattleMech lance were led by Lieutenant Gray, it would be called *Gray's Lance*.

Company A01.04.02

Three lances form a company, commanded by a captain or a senior lieutenant. In all, a company contains 12 BattleMechs and 28 men. As with lances, the makeup may vary from company to company, depending on its position in the battalion TOE.

Battalion A01.04.03

Three companies make up a battalion, commanded by majors or lieutenant colonels. Full-strength units contain 36 Mechs and 72 men.

Regiment A01.04.04

Three battalions plus a DropShip transport section form a BattleMech regiment. Every regiment is commanded by a colonel and contains 108 Mechs, 18 AeroSpace fighters, and 252 men. Regiments are known either by a traditional title or by their colonel's name, for example *The 15th Crucis Hussars* or *Yamashita's Regiment.*

The Transport Section A01.04.05

The transport section contains enough DropShips to carry the entire regiment in one lift. There are three different DropShip classes; most regimental commanders prefer a mix of these, believing that it adds flexibility and survivability. *Leopard* Class DropShips can carry a lance or an air lance of up to 4 Mechs and 2 AeroSpace fighters. *Union* Class ships can carry up to 12 Mechs and 2 fighters. *Overlord* Class ships can transport a full battalion of 36 BattleMechs and 6 fighters.

Vehicle And Infantry Units A01.04.06

Tanks and lightly armed vehicles also can be found on the battlefields. Though they are technically primitive when compared to BattleMechs, they are the most advanced weapons that many worlds in the Successor States can manufacture. Tank and infantry units garrison planets throughout the Human Sphere.

APDX.02 BATTLEMECH DATA

A02.00.00 THE BATTLEMECHS

A02.00.01 Internal Structure

Every BattleMech is built around a man-like "skeleton" made up of several dozen composite "bones." Each bone contains a honeycombed, foamed-aluminum core wrapped with stressed silicon-carbide monofilament and protected by a rigid, titanium-steel shell. Every strong, ultralight artificial bone provides attachment points needed for the "muscles" and other servos that actually drive the BattleMech. Their skeletal construction helps make BattleMechs less vulnerable and easier to repair than vehicles built with a stressed-skin shell.

BattleMechs use two different systems to drive and control their movements. Light weapons and sensor arrays are propelled by small, electrically-driven rotary or linear actuators. Larger movements involving the limbs and main weapons are controlled by the polyacetylene fiber bundles called myomers. Myomers contract strongly with electrical stimulus, duplicating the operation of human muscle tissue, though obviously on a much larger scale. Battlefield repairs to damaged limbs can easily be made by either replacing damaged myomers or by transferring bundles from other parts of the Mech's skeleton. Transferred myomers cannot restore full function to a damaged limb, but they can give it back limited mobility and strength.

Depending on their size and weight, BattleMechs can reach walking or running speeds ranging from 40 to 150 kph in open terrain. Dense forests, swamps, and steep slopes will slow them down, but very few terrain features can stop them.

A02.00.02 Armor

Mechs are protected by two separate layers of armor, each only a few inches thick. An outer layer of aligned-crystal steel with good heat conductivity provides protection from lasers and particle beam weapons. It is also rigid and tough enough to stop almost any conventional projectile. An inner layer of boron nitride impregnated with diamond monofilament stops high-explosive armor-piercing (HEAP) rounds and fast neutrons. This second layer of armor also stops armor fragments from piercing the BattleMech's interior.

A02.00.03 Power System

These armored giants require tremendous amounts of energy for movement and combat. The fusion reactor provides virtually unlimited power, enough so that BattleMechs can be adapted to fight in environments ranging from sun-baked deserts to sub-zero arctic ice fields. The fusion reaction does not release neutrons, so the power plant can be run indefinitely without becoming radioactive.

A02.00.04 Heat Sinks

In combat, a BattleMech's power plants, movement, and energy weapons quickly produce large amounts of waste heat that must be eliminated. Heat retention is always a serious problem, for two main reasons. First, even moderate internal temperatures can disrupt the magnetic containment fields around the reactors, thus damaging such vital systems as the Mech's targeting computers. If a power plant's magnetic "jar" is disrupted, fusion reactions releasing neutrons could occur, causing serious radiation damage to both the internal systems and the crew. Second, the

BATTLEMECH DATA APDX.02

Mech's electronics and computer systems are temperature-sensitive. High heat can damage them, slowing the Mech's movement and reducing the accuracy of its weapons.

BattleMechs control their internal temperatures by radiating waste heat and by strictly regulating the rate at which they move and fire. All Mechs are equipped with radiating heat sinks to help dissipate heat. The heat pouring out of these radiators gives each machine an enormous IR (infrared) signature.

Sensors A02.00.05

In addition to their sophisticated movement control systems, BattleMechs need computers to help handle a wide variety of sensor information and weapons systems. In most Mechs, these secondary systems are comparatively simple data processors constructed with currently available technology.

Mechs rely on a number of different sensors for information, including light-intensifier optics and laser range-finding systems.

Weaponry A02.00.06

BattleMechs usually carry charged particle beam weapons or lasers as their main armament. Energy weapons are preferred because they can be powered almost indefinitely by the on-board fusion reactor. In addition, many carry launching racks for short- or long-range, non-nuclear missiles. Some Mechs are even equipped with rapid fire autocannons or machine guns for use against infantry, aircraft, and other BattleMechs. See Appendix 3 for further information.

Life Support System A02.00.07

Each Mech has a sealed-environment, two-position, crew compartment. Complete with chemical atmosphere-regenerators, food, water, and other supplies, the compartment can sustain the pilot and one passenger for up to a week, even in hostile environments.

Both positions in the crew compartment are equipped with ejection seats. If a BattleMech takes catastrophic damage, its pilot and passenger can blow open the back of the Mech's head to eject out.

APDX.02 BATTLEMECH DATA

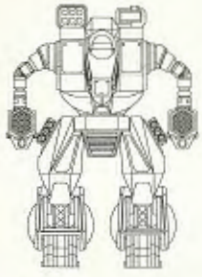
A.02.01.00 *LOKI* HEAVY BATTLEMECH

The *Loki* BattleMech is very heavily armed and armored. It concentrates on energy weapons that deliver an enormous amount of damage, but which are designed for close-in combat. The *Loki*'s armor is designed for good coverage all around; its back armor is the heaviest of any BattleMech. The *Loki*, though named for a Terran messenger, is relatively slow. The standard *Loki* variant dissipates two points of heat per second, but some variants mount additional heat sinks. The *Loki* has 14.5 tons of armour and accelerates and deccelerates at 20 m/sec², some versions add armour and/or acceleration.

A.02.01.01 *Loki Prime*

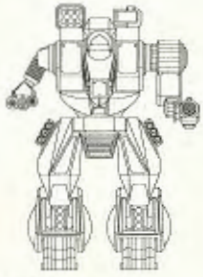
A.02.01.02

Top Speed: 97 kph
Weaponry:
2 AFC 50 mm
1 SRM 6-Pack
2 Medium Lasers
2 Small Lasers
2 Machine Guns



Loki V1

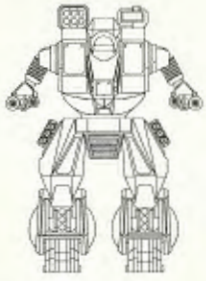
Top Speed: 97 kph
Weaponry:
1 AFC 100 mm
1 SRM 2-Pack
1 PPC
1 Large Laser
3 Medium Lasers
2 Small Lasers
2 Machine Guns



A.02.01.03 *Loki V2*

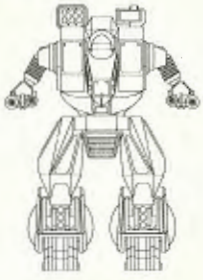
A.02.01.04

Top Speed: 118 kph
Weaponry:
2 PPC
1 SRM 6-Pack
2 Large Lasers
2 Medium Lasers
Heat Sinks: 3 Additional Dissipation + 0.6 p/s



Loki V3

Top Speed: 64 kph
Weaponry:
4 PPC
1 SRM 6-Pack
2 Medium Lasers
2 Small Lasers
Heat Sinks: 6 Additional Dissipation + 1.2 p/s

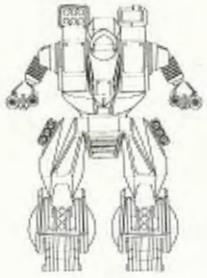


BATTLEMECH DATA APDX.02

A.02.01.05
A.02.01.06

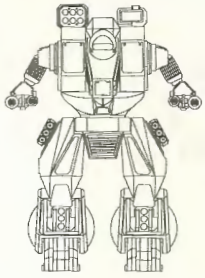
Loki V4

Top Speed: 54 kph
Weaponry:
1 SRM 2-Pack
5 Large Lasers
2 Medium Lasers
2 Small Lasers
2.0 Tons Extra Armour
Heat Sinks: 11 Additional
Dissipation + 2.2 p/s



Loki V5

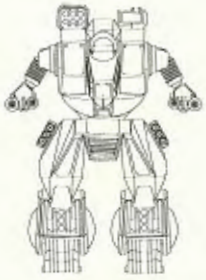
Top Speed: 130 kph
Weaponry:
1 SRM 6-Pack
2 Medium Lasers
9 Small Lasers
5.5 Tons Extra Armour
50 m/sec² Accel./Deccel.
Heat Sinks: 5 Additional
Dissipation + 1.0 p/s



A.02.01.07
A.02.01.08

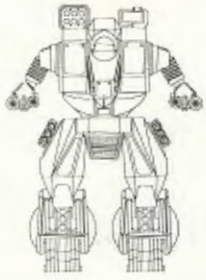
Loki V6

Top Speed: 151 kph
Weaponry:
1 SRM 2-Pack
8 Medium Lasers
2 Small Lasers
0.5 Tons Extra Armour
40 m/sec² Accel./Deccel.
Heat Sinks: 5 Additional
Dissipation + 1.0 p/s



Loki V7 (Drone Variant)

Top Speed: 162 kph
Weaponry:
1 SRM 2-Pack
2 Small Lasers
0.5 Tons Extra Armour
40 m/sec² Accel./Deccel.
Heat Sinks: 1 Additional
Dissipation + 0.2 p/s



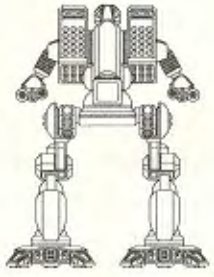
APDX.02 BATTLEMECH DATA

A02.02.00 *VULTURE* HEAVY BATTLEMECH

The *Vulture* is designed to look mean, and it fulfills this expectation admirably. This great, carnivorous bird of the battlefield is fast and deadly. Packing lots of long range missiles, it is very effective at long distance, while its lasers equip it for fighting close-in. The *Vulture*'s armor is spread somewhat thinner than the *Loki*'s, but its speed makes up for this deficiency. The *Vulture*'s heat sinks dissipate two points of heat per second. The *Vulture* has 14.5 tons of armour and accelerates and deccelerates at 20 m/sec^2, some versions add armour and/or acceleration.

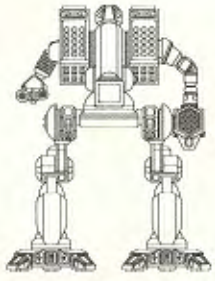
A02.02.01 *Vulture Prime*

Top Speed: 97 kph
Weaponry:
2 LRM 20-Packs
2 Large Lasers
2 Medium Lasers
2 Small Lasers



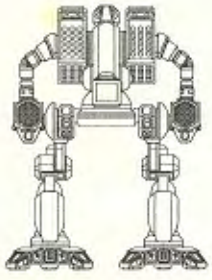
A02.02.02 *Vulture V1*

Top Speed: 118 kph
Weaponry:
2 LRM 15-Packs
2 Large Lasers
2 Medium Lasers
2 Small Lasers
2 Machine Guns



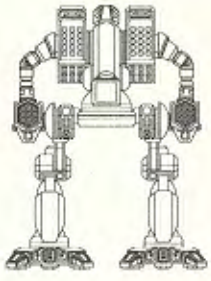
A02.02.03 *Vulture V2*

Top Speed: 129 kph
Weaponry:
2 LRM 10-Packs
2 Large Lasers
2 Medium Lasers
2 Small Lasers
2 Machine Guns



A02.02.04 *Vulture V3*

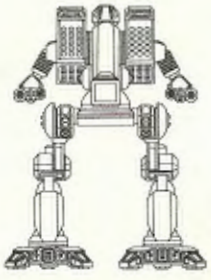
Top Speed: 151 kph
Weaponry:
2 SRM 6-Packs
2 Medium Lasers
4 Machine Guns
40 m/sec^2 Accel./Deccel.



A02.02.05

Vulture V5

Top Speed: 65 kph
Weaponry:
- 4 LRM 15-Packs
- 2 Medium Lasers
- 2 Machine Guns
- 4.5 Tons Extra Armour



V4
Reload
4 sec
6 SRM
2 ML
4 SL
Damage
29
5
3
119 KPH 15.5 X-ton arm

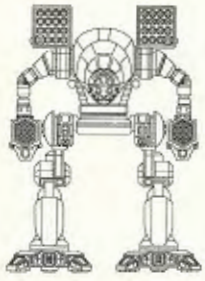
APDX.02 BATTLEMECH DATA

A02.03.00 *MADCAT* HEAVY BATTLEMECH

The *Madcat* is a design combination of two older BattleMechs, both of which contributed to its name: the *Marauder* and the *Catapult*. It is the most balanced BattleMech design, not favoring speed, long range or short range weapons, but creating a Mech that can accomplish all three. The *Madcat*'s armor is spread like the armor of the *Vulture* and it dissipates two points of a heat per second.The *Madcat* has 14.5 tons of armour and accelerates and deccelerates at 20 m/sec^2, some versions add armour and/or acceleration.

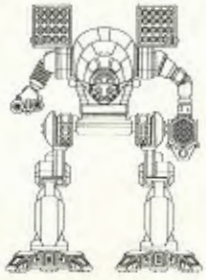
A02.03.01 *Madcat Prime*

Top Speed: 97 kph
Weaponry:
2 LRM 15-Packs
1 PPC
2 Large Lasers
2 Medium Lasers



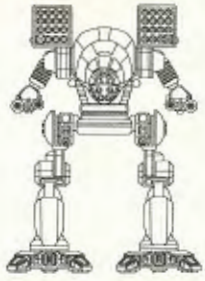
Madcat V1

Top Speed: 97 kph
Weaponry:
2 LRM 10-Packs
1 AFC 50mm
1 Large Laser
2 Medium Lasers
2 Small Lasers
2 Machine Guns



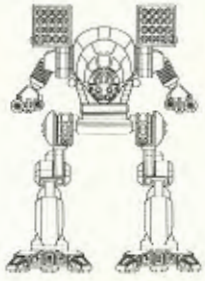
A02.03.03 *Madcat V2*

Top Speed: 118 kph
Weaponry:
2 LRM 15-Packs
2 Large Lasers
2 Medium Lasers
2 Small Lasers
2 Machine Guns



Madcat V3

Top Speed: 151 kph
Weaponry:
2 LRM 10-Packs
4 MediumLasers
2 Small Lasers
2 Machine Guns



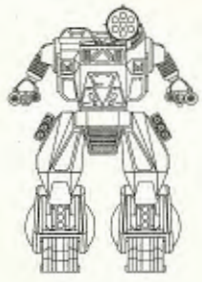
BATTLEMECH DATA APDX.02

THOR HEAVY BATTLEMECH A02.04.00

The unique asymmetrical design of the *Thor* lends itself to more widely differing variants than any other design. Because of its versatility, a *Thor*'s opponent must carefully study the configuration or get a deadly surprise. The *Thor*'s armor is like the *Loki*'s, but is slightly thinner in the back. The heat sinks of the standard *Thor* variant will dissipate two points of heat per second, though some versions mount additional heat sinks. The *Thor* has 14.5 tons of armour and accelerates and deccelerates at 20 m/sec², some versions add armour and/or acceleration.

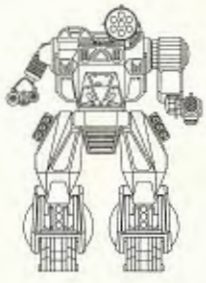
Thor Prime A02.04.01

Top Speed: 97 kph
Weaponry:
1 LRM 10-Pack
2 AFC 25 mm
2 Large Lasers
4 Small Lasers



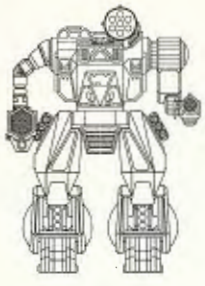
Thor V1 A02.04.02

Top Speed: 97 kph
Weaponry:
1 AFC 100 mm
1 SRM 6-Pack
2 Large Lasers
2 Medium Lasers
2 Small Lasers
2 Machine Guns



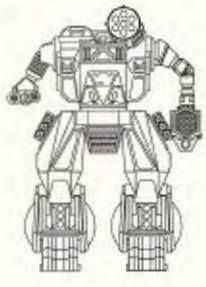
Thor V2 A02.04.03

Top Speed: 86 kph
Weaponry:
1 LRM 10-Pack
1 PPC
1 AFC 100 mm
1 Large Laser
2 Medium Lasers
1 Small Laser
1 Machine Gun



Thor V3 A02.04.04

Top Speed: 118 kph
Weaponry:
1 LRM 20-Pack
1 PPC
1 Large Laser
3 Medium Lasers
2 Small Lasers
2 Machine Guns
Heat Sinks: 3 Additional
Dissipates +0.6 p/s

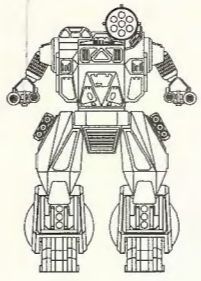


APDX.02 BATTLEMECH DATA

A02.04.05
A02.04.06

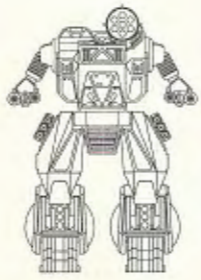
Thor V4

Top Speed: 130 kph
Weaponry:
1 SRM 6-Pack
1 PPC
2 Large Lasers
2 Medium Lasers
2 Small Lasers



Thor V5

Top Speed: 162 kph
Weaponry:
1 LRM 10-Pack
5 Medium Lasers
1 Small Lasers

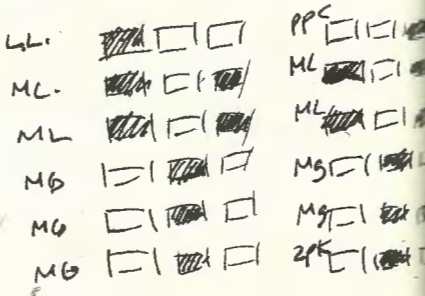


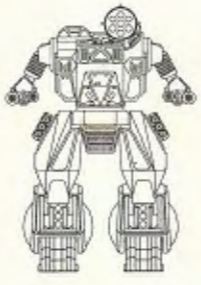
A02.04.07

Thor V6

Top Speed: 119 kph
Weaponry:
1 LRM 10-Pack
1 PPC
1 Large Lasers
4 Medium Lasers
5 Machine Guns
1.5 Tons Extra Armour
Heat Sinks: 5 Additional
Dissipates +1.0 p/s

L button
2 med las - LL R butt
2 med las - trigger
2 machs





ank
LL
LRM R button
PPC
4 laser L butt
3 on trigger

0 → 10,000

WEAPONS DATA APDX.03

WEAPONS DATA A03.01.00

Weapons mounted on Battlemechs include three types, depending on their respectiv method of delivery. Direct- and indirect-fire weapons deliver damage from a distance. Close-range or contact weapons deliver damage from actual contact with the target. For the purposes of this summary, only direct-fire and indirect fire weapons will be included.

Direct Fire Weapons A03.01.01

Definition A03.01.01.01

Direct fire weapons are defined as those which require a line-of-sight (LOS) trajectory in order to obtain a successful strike against their target. Direct fire weapons are subdivided into expendable munitions projectile weapons, energy-projectile weapons, and energy beam weapons.

Weapons Data A03.01.01.02

Direct-Fire Expendable Munitions Projectile Weapons

Munitions Projectile Weapon Name	Standard Abbr.	Relative Damage	Heat Released	Reload Time	Max. Range
Machine Gun	MG	1	0	0.1	400 m
25mm AutoFire Cannon	AFC 25	10	1	4	1200 m
50mm AutoFire Cannon	AFC 50	20	3	6	900 m
100mm AutoFire Cannon	AFC 100	35	7	10	600 m

Direct-Fire Energy-Projectile Weapons

Energy-Projectile Weapon Name	Standard Abbr.	Relative Damage	Heat Released	Reload Time	Max. Range
Particle Projection Cannon	PPC	10	10	8	1000 m

Direct-Fire Energy Beam Weapons

Energy Beam Weapon Name	Standard Abbr.	Relative Damage	Heat Released	Reload Time	Max. Range
Small Laser	S Lsr	3	1	1	300 m
Medium Laser	M Lsr	5	3	4	600 m
Large Laser	L Lsr	8	8	6	900 m

APDX.03 WEAPONS DATA

A03.01.02 Indirect Fire Weapons

A03.01.02.01 Definition

Indirect fire weapons are defined as those which require a ballistic trajectory in order to obtain a successful strike against their target. Indirect fire weapons are expendable munitions projectile weapons, including both long-range missiles (LRMs) and short-range missiles (SRMs). Though SRMs are sometimes thought of as being direct-fire weapons because of their apparent LOS trajectory, they are grouped with indirect-fire weapons in this manual because of the demands they place on the targeting system. Damage for indirect fire weapons is determined by the number of projectiles that actually hit the target.

A03.01.02.02 Weapons Data

Indirect Fire Expendable Munitions Projectile Weapons

Indirect Fire Projectile Weapon Name	Standard Abbr.	Relative Damage	Heat Released	Reload Time	Max. Range
Short-Range Missile 2 Pack	SRM 2	8	1	2	600 m
Short-Range Missile 6 Pack	SRM 6	24	4	4	600 m
Long-Range Missile 5 Pack	LRM 5	10	2	2	6000 m
Long-Range Missile 10 Pack	LRM 10	20	4	5	6000 m
Long-Range Missile 15 Pack	LRM 15	30	5	7.5	6000 m
Long-Range Missile 20 Pack	LRM 20	40	6	10	6000 m

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